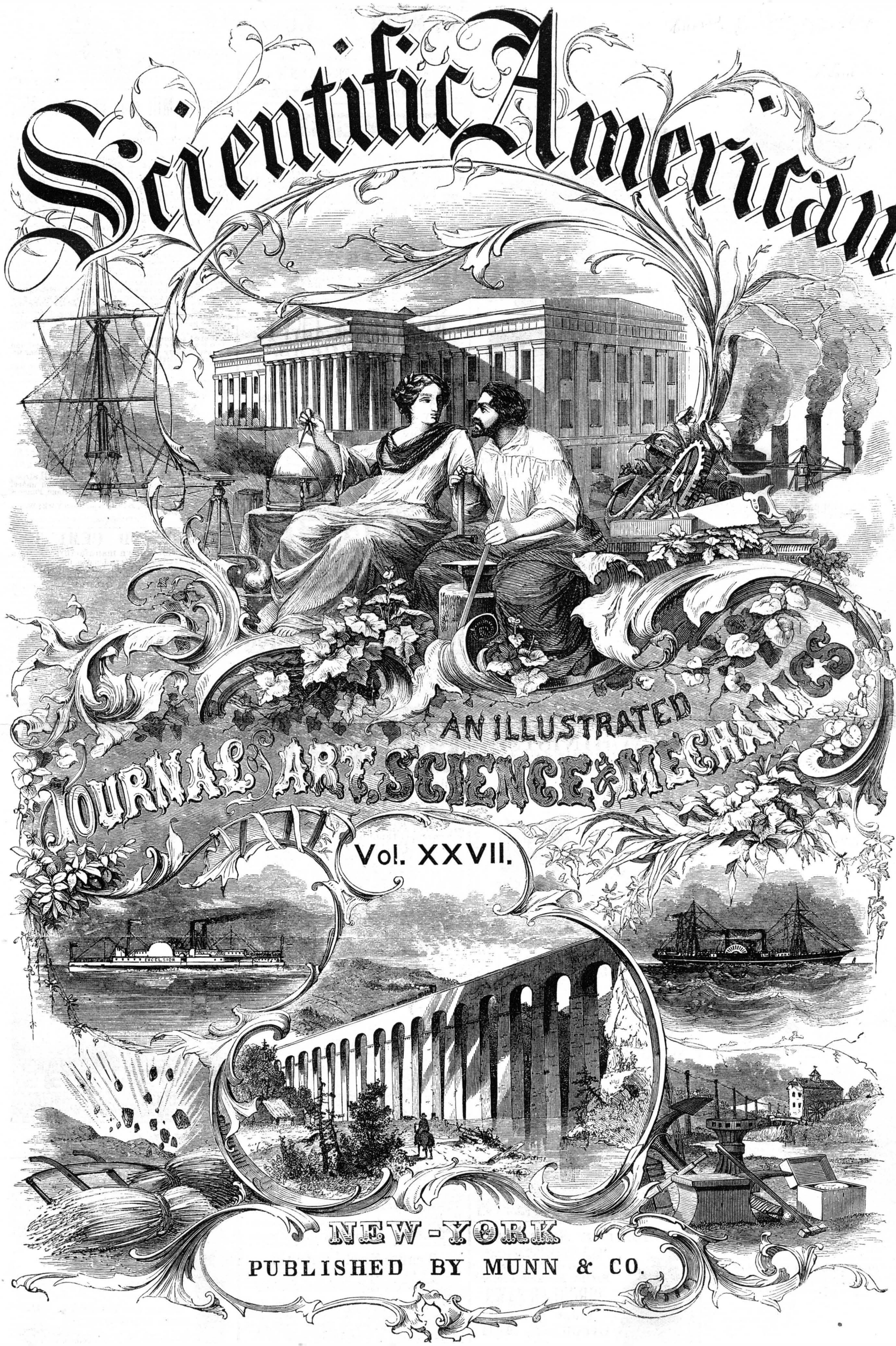
Scientific American



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Vol. XXVII.

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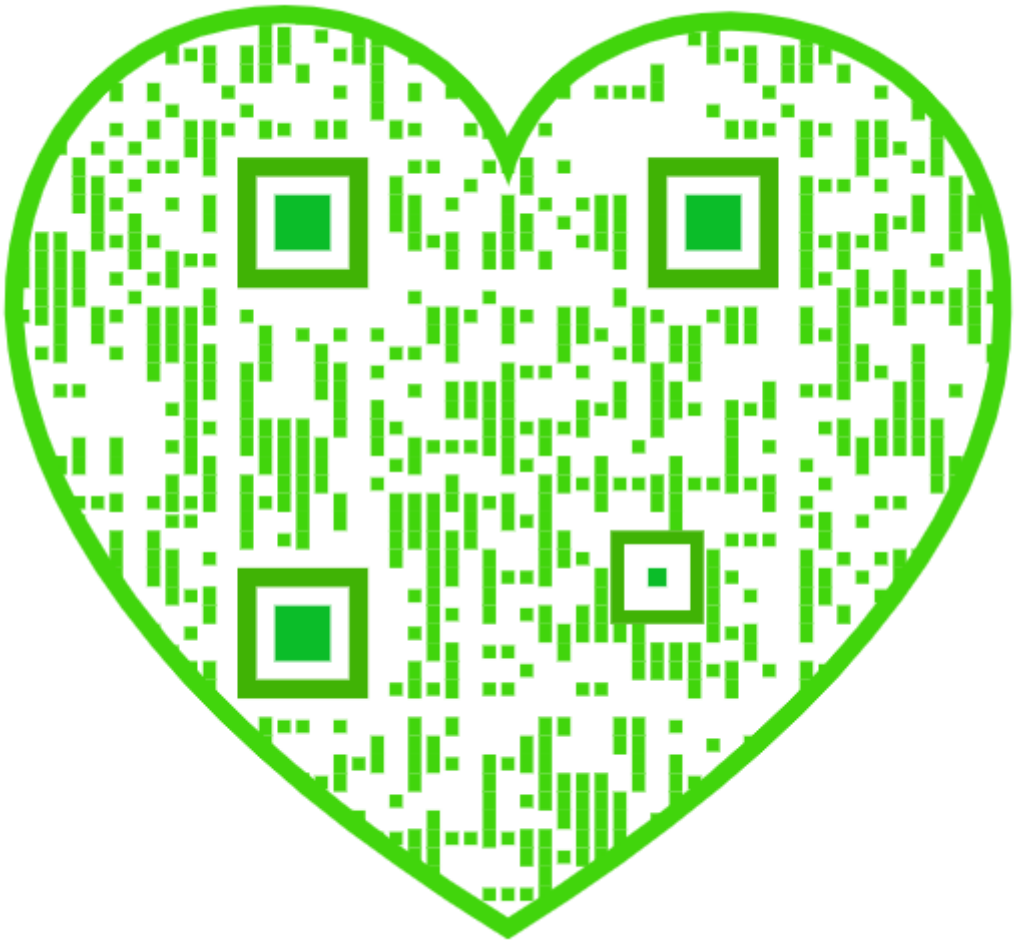


SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVII.—No. 1. [NEW SERIES.] NEW YORK, JULY 6, 1872. $3 per Annum. [IN ADVANCE.]

IMPROVED STEAM HEATER.

We this week illustrate Bosley's patent low pressure boiler for steam heaters. It is calculated to burn soft or hard coal, coke, or wood. It is built of horizontal cast iron sections, placed one above the other in any required number.

Fig. 1 represents the boiler with a portion broken out so as to show the internal arrangement. Fig. 2 is a perspective view of one of the sections. It will be seen to consist of an annular water space, A, and of cross tubes, B (which may be from three to five in number) connecting one half of the annulus with the other. The upper and lower sides are provided with perforations as at C, and are flanged in order to make the connections. The sections, after being planed smooth and even, are placed so that the upper one of each pair has its cross tubes at right angles with those of the lower one, and so that the perforations, C, in both, may come together. Other angles may be chosen if the latter condition is fulfilled. A lead joint is then made, and the opposing flanges bolted together. Fig. 3 shows, in vertical section, a pair of these sections thus arranged.

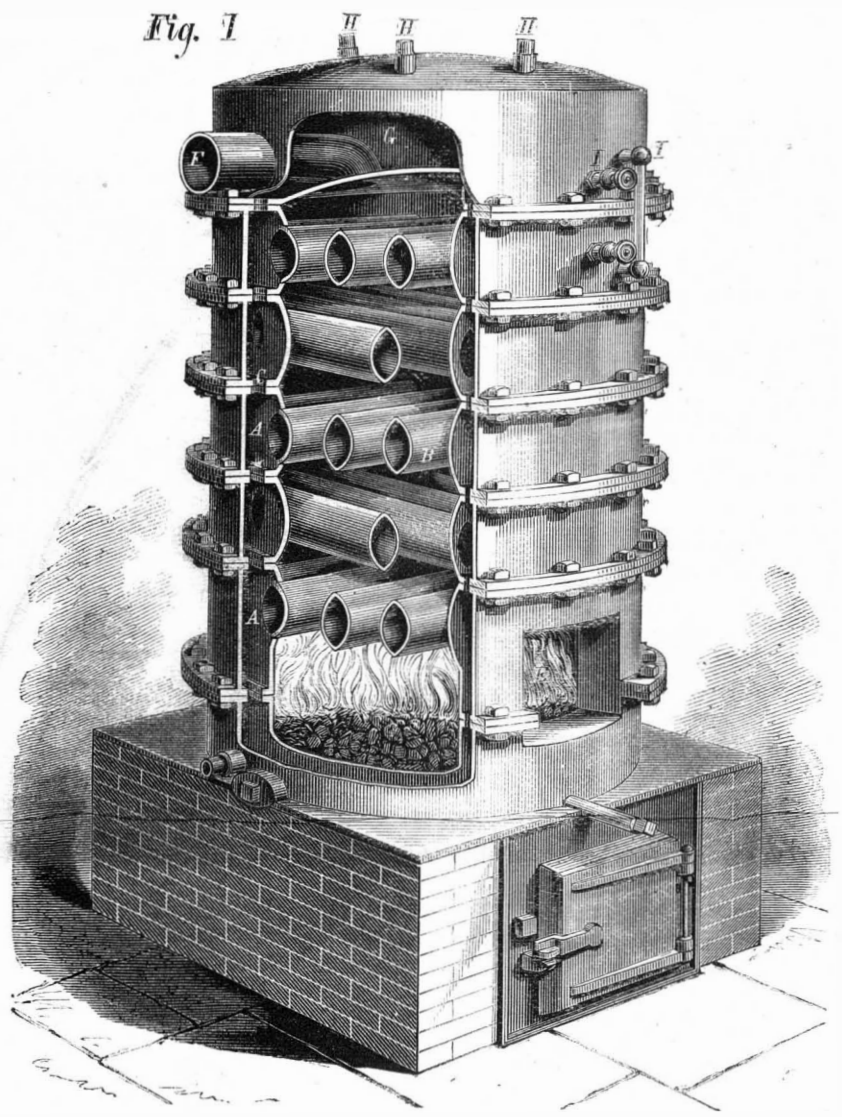
It will be observed that the tubes (as shown at B) incline from the horizontal to allow of free circulation of the water. The sections are now being made of either three or four feet diameter, and the capacity of the boiler is regulated by the number placed in pile.

With this explanation, the entire construction will be understood from Fig. 1, where D is the ash pit, E the fireplace, F the smoke pipe, and G the steam dome. H H H are steam pipe couplings, of which as many as are needed may be attached to the dome. At I are shown the water gage and try cocks. The lowest section of the boiler consists of the annulus only, without the cross tubes, which forms a water leg around the fire, and is provided with hand-hole plates for the removal of sediment. This boiler is stated to have a foot of heating surface to every three quarts of water, and to require a surprisingly small quantity of fuel to generate steam.

It is easily put up and is strong and durable, with no liability to burn out. It has been in successful operation for two years, and its perfect circulation proved by the absence of all tendency to foam.

There is no question that a boiler built on this principle would sustain more than all the pressure which would be required in heating a building by either high or low pressure steam or hot water; and no doubt as to its perfect safety, when employed for either of these purposes, need be entertained. A great advantage arising from the mode of construction lies in the perfect ease with which the size of the boiler can be adjusted to that of the particular building to be heated by it. The sections are simply connected in sufficient number to give the intended capacity, and the boiler is completed by the addition of the steam dome—no special alteration of its parts being needed in any case. The inventor states that its first cost is less than that of any other first class heating apparatus yet introduced, which, when taken in connection with its durability, becomes an important item. Further, the comparatively very small consumption of fuel in this boiler is greatly in its favor. Patented May 10, 1870. Further information may be obtained of Messrs. J. Weatherby & Sons, Nos. 11 and 13 North Liberty street, Baltimore, Md.

Fig. 1



BOSLEY'S PATENT STEAM HEATER.

Fig. 2

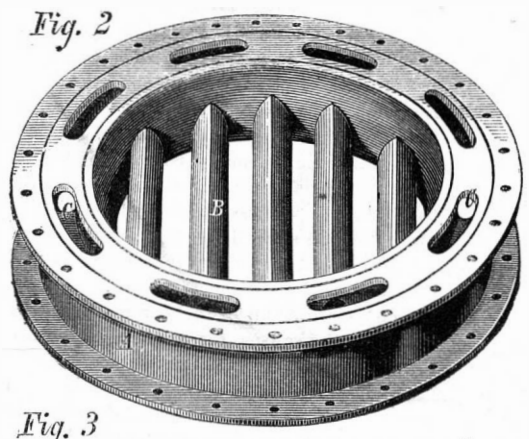
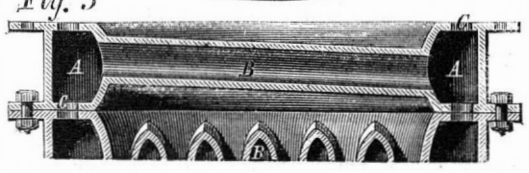


Fig. 3



Improved Blowpipe.

A common wide mouthed bottle is carefully fitted with a caoutchouc cork bored with two holes, into each of which passes a piece of glass tube bent at a right angle. On to one of these tubes is slipped the caoutchouc tube coming from an ordinary caoutchouc bellows, whilst the other is put in communication with the blowpipe nozzle by means of four pieces of caoutchouc tubing joined by three pieces of glass tube drawn to a fine point at each end. This forms the main peculiarity of the arrangement. When air is forced into the bottle by the blower in jerks, it finds a difficulty in escaping as fast as it comes in, on account of the six fine openings in the glass tubes that it has to pass through on its way from the bottle to the nozzle, and it thus acquires a certain pressure in the bottle and flows out toward the nozzle as a regular blast. The bottle may be about 6 inches high by 3½ inches wide, with a neck 1½ inches diameter; but of course the dimensions are of no great importance. On the whole, a somewhat large bottle is better than a small one. The pieces of glass tubing we use are 2 inches long by ⅛ inch in diameter. The apparatus will be stronger if, instead of a glass bottle, a tin cylinder is used, about 4 inches high by 2 inches in diameter, with two tin tubes opening into its top. Small metal cylinders, with a fine hole at each end, may be used instead of the little glass tubes. A blowing apparatus constructed in this manner will deliver a perfectly regular blast, and will be of practical interest to those who are thinking of working in places where it is difficult or impossible to repair the ordinary instruments.

FEVER AND AGUE.—Some one thus describes it: "It comes creeping up a fellow's back like a tun of wild cats, goes crawling up his joints like iron spikes, and is followed by a fever which prohibits the patient from thinking of anything but the Independent Order of Good Templars. It isn't the 'every other day' kind, but gets up with a man at daylight, and sleeps in the small of his back all night. His teeth feel about six inches too long, his joints wobble like a loose wagon wheel, and the shakes are so steady that he can't hold any sort of conversation except by putting in dashes."

SHIVE'S WATCHMAN'S CLOCK.

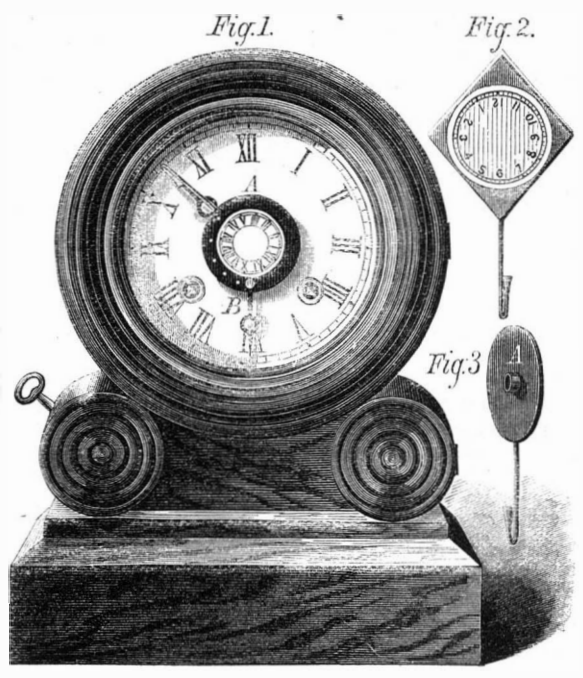
Our engraving illustrates a watchman's clock and time detector, invented and patented April 19, 1870, by Mr. D. Shive, of Philadelphia. It is designed to obviate the inconveniences met with in using other devices of a similar nature, and is very simple in its construction, and can be sold very cheaply.

Fig. 1 shows the clock complete. At A is a small dial with an edge of slate, which is attached to the center post of the clock, and also by a wire to the hour hand. The wire is curved so as to allow free passage of the minute hand under it. It is represented as attached to the hour hand in Fig. 1, and is seen in detail in Fig. 3, which gives a back view of the dial, A. At B is shown a small hole made in the glass which covers the clock face in front of the slate edge of the dial, A, The operation will be readily understood: The small dial, A, revolves, with the hour hand, once in twelve hours, during which time it presents, successively, every portion of the slate edge or ring o the hole, B, and it is so set that the time kept by it, using the hole as an index, agrees with that of the clock. Now, if from time to time a pencil be passed through the hole and a mark made by it on the dial edge, a record will be kept thereon of the precise time when each mark is made. The watchman is directed to mark the small dial every hour, half-hour, or other period selected by his employer, and the apparatus faithfully records in what manner he performs his duty. In Fig. 1, marks are shown at each hour from six o'clock. Supposing the clock to be running, and the watchman now to mark the dial, it will record that he did so at half-past ten, which is also the time by the clock. If from any cause he should neglect to make the marks, their absence from the dial will reveal the fact. In order to prevent the clock being tampered with, the door is secured by a tumbler lock which cannot be readily picked, and no two of these locks are made alike. As the key never comes into the watchman's hands, he cannot duplicate it. The clock, which is a first class eight day timepiece and strikes the hour, is secured in position by screws driven from the inside, and cannot be removed without violence.

Fig. 2 is another style of marking dial, which is, however, used in the same manner as the dial, A. It is a paper dial contained in a thin brass case. These paper dials are changed every day, and can be filed away for reference if required. With the slate dial, all that is necessary is to wipe off the marks of the pencil daily.

Further information may be obtained of the Shive Governor Company, N. W. corner 12th and Buttonwood streets, Philadelphia, Pa., who are the manufacturers.

Fig. 1. Fig. 2.



ACCORDING to the last census, there are in the United States five millions of children, of school age, who never attend school!

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LOCOMOTIVE BOILER EXPLOSION.

One of the most destructive boiler explosions which has recently come under our notice, our readers will find represented in the accompanying engraving, which is from a photograph furnished by our correspondent, Mr. Charles D Bingham. It seems that, on the 9th ult., the locomotive *Charles Millar*, of the Utica and Black River Railroad, while preparing to start out from the depot at Watertown, N. Y., suddenly exploded, the boiler being under a pressure of but 105lbs. of steam.

The whole top of the boiler, weighing some 2,000 lbs., was projected into the air to a hight of at least six hundred feet, falling at a distance of a quarter of a mile from the engine. Other portions of the machinery were hurled nearly half a mile away, many tearing through roofs of houses, but providentially injuring no one. The smoke stack was thrown some two hundred feet, falling between a couple of freight cars. One of the heavy driving wheels was tossed ten feet away like a feather, and the steel connecting rod twisted out of all shape. The force of the explosion was terrific, shattering every window in the vicinity, and, as is shown in our illustration, expending itself on the forward portion of the locomotive. The apparatus in the interior of the cab escaped with but little damage, and its occupants at the time—the engineer and fireman—were, strange to say, unhurt.

No lives being lost, it is of course probable that the circumstance will, in course of time, be forgotten, and no official investigation made; but a mere superficial examination of broken portions of the boiler conclusively proves gross and criminal negligence on the part of the railroad company. Our correspondent informs us that the iron was corroded in places almost entirely through; that he saw a deposit of scale in a rust crack which extended within one tenth of an inch of the outside surface, and that the thickness of sound iron varied from one eighth to one thirtieth of an inch. The employees of the road state that the boiler had been in use for over seventeen years, and the condition of the pieces shows that it had been poorly cared for.

What the consequences would have been, had this accident occurred when the locomotive was attached to a passenger train in motion, or had it been stationary in a crowded depot, we leave our readers to conjecture. There are plenty of laws in our statute books which compel parsimonious corporations to manifest some regard for human life, and it is the duty of the government to enforce them. We have no doubt but that there are hundreds of locomotive boilers throughout the country which are in as bad a condition as this one was, and which may at any moment prove the means of a fearful calamity.

AN EXPLODED LOCOMOTIVE.—[From a Photograph.]

THE DUCKING STOOL.

From the tenor of some of the early colonial laws, the cold water cure was evidently an established institution, and, in 1634, applied especially in the healing of running tongues, with which the ladies were troubled. We are indebted to that excellent periodical, *The American Historical Record*, for the accompanying engraving of the Ducking Stool, a queer machine for punishment which was used in Virginia and other colonies, in early times. The *Record* also gives the following historical letter descriptive of the manner in which the machine was practically employed:

Hungar's Parish, Ackowmake,
Virginia, June y^e 16th, 1634.

Hon^rd Sir,

Methinks I've been grately blest by Providence since coming into these parts, for I've been allowed, without let or hinderance, to see how y^e people deport themselves in their Families, their Churches, and their Courts.

It is undeniable y^t they endeavor to live amiably, keep y^e peece in families and communities, and by divers means try to have harmony and good-will amongst themselves and wi th Strangers who may sojourn among them. For this they u se a device which they learned in England, they say, to keep foul tongues y^t make noise and mischief, silent, and of which I must faine tell you.

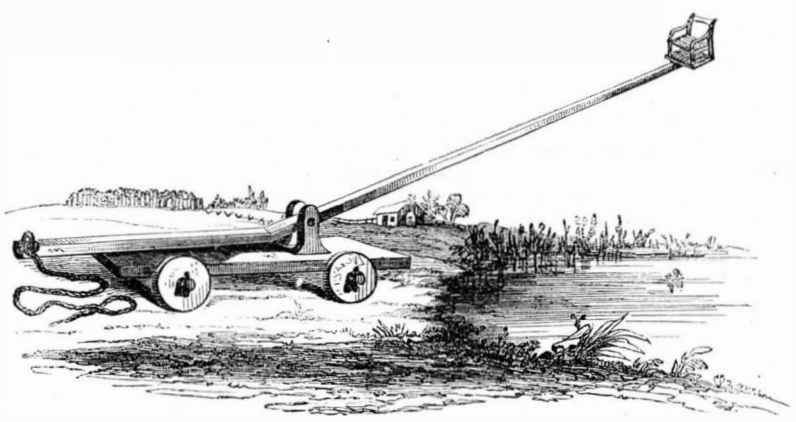
They have a Law which reades somewhat in this wise: "Whereas it be a sinn and a shame for scolding and lying Tongues to be left to run loose as is too often the way amongst women, be it therefore enacted y^t any woman who shall, after being warned three severall times by y^e Church, persist in excessive scolding, or in backbiting her neighbors, shall be brought before y^e Magistrate for examination, and if y^e offence be fairly proved upon her, shee shall be taken by an Officer appointed for y^e purpose, to y^e nearest pond or deepe streame of water, and there, in y^e presence of said Magistrate and of her accusors, be publicly ducked by said officer in y^e waters of s^d pond or streame until shee shall make a solemn promise y^t shee'l never sin in like manner again."

The day afore yesterday at two of y^e clock in y^e afternoon, I saw this punishment given to one Betsey, wife of John Tucker, who, by y^e violence of her tongue had made his house and y^e neighborhood uncomfortable. She was taken to the y^e pond near where I was sojourning, by y^e officer who was joyned by y^e Magistrate and y^e Minister, Mr. Cotton, who had frequently admonished her, and a large number of People. They had a machine for y^e purpose y^t belongs to y^e Parish, and which I was told had been so used three times this Summer. It is a platform with 4 small rollers or wheels, and two upright posts between which works a Lever by a Rope fastened to its shorter or heavier end. At y^e end of y^e longer arm is fixed a stool upon which s^d Betsey was fastened by cords, her gown tied fast around her feete. The Machine was then moved up to the edge of y^e pond, y^e Rope was slackened by the officer, and y^e woman was allowed to go down under y^e water for the space of half a minute. Betsey had a stout stomach, and would not yield until shee had allowed herself to be so ducked 5 severall times. At length shee cried piteously, "Let mee go! let mee go! by God's help I'll sin so no more." Then they drew back y^e machine, untied y^e Ropes and let her walk home in her wetted clothes, a hopefully penitent woman.

Methought such a reformer of great scolds might be of use in some parts of Massachusetts Bay, for I've been troubled many times by the clatter of y^e scolding tongues of women y^t like y^e clack of y^e Mill seldom cease from Morning till Night.

I expect to stay here about the space of a moon yet, when I shall go in a vessel from Jamestown to Salem, where I shall have y^e honor of saluting you and Mr. Williams, as y^r Humble, and most Ob^t Servant, THOMAS HARTLEY.

Governor ENDICOTT.



THE DUCKING STOOL.

Cement from Sewage.

A new method of disposing of sewage, by making it into cement, has been practically and successfully tested during the last six months at Ealing, a village to the west of London. Major General Scott is the inventor and patentee of the process. The principle of the process consists in mixing, with the sewage, quantities of lime and clay, the former ingredient combining with the carbonic acid of the fecal matters to form carbonate of lime, which is precipitated with the solid ingredients in the form of an impalpable powder. The lime and clay are preferably thrown into the main sewer some little distance before reaching the outlet, so as to insure a more complete incorporation of the different matters, while at the same time destroying the slimy glutinous character of the sewage "sludge," and keeping the drain clean and free from the festering and putrefying deposit which otherwise tends to choke it. The clay and the lime do not merely facilitate the deposition of solid matter, but, as is well known, they tend to purify the supernatant water. Now, lime and clay are the chief constituents of those limestones which, on calcination, yield the best hydraulic limes and cements; and it is claimed for this process that there is a sufficient gain of cement-making material abstracted from the sewage to make the operation profitable, independently of the advantages gained by thus deodorizing and defecating the excrementitious matters of towns, which must otherwise be disposed of in a manner more or less unhealthy, and very often at great expense.

The success of the new process depends in no small degree on the fact that the precipitated matter supplies to a considerable extent the fuel necessary for the burning operation. The sewage being allowed to settle in tanks and the supernatant water drawn off, it is found to be thoroughly deodorized and may be exposed to the drying action of the air for an indefinite period, without giving rise to any offensive or deleterious vapors. It is then dried on tiles, beneath which the heated gases of the furnace are made to pass, and is then calcined in the ordinary manner. The fecal matters which subside in the settling tanks are found to consist to a large extent of organic compounds, which, when dried and distilled, yield large quantities of inflammable gases; and although the proportion of carbon may be small, the hydrogen gives a most intense heat, the sewage thus supplying the greater portion of fuel required to turn it into cement.

The Price of Iron.

The last paragraph in a circular on the price of iron, just issued by Messrs. G. Bailey Toms and Company, of England, runs as follows: "It would appear that iron prices in all producing countries—Belgium, America, Germany, Sweden, and France—have risen *pari passu* with those of Great Britain, thus bearing witness to the universality of the great demand as well as the short supply. No sinister clouds are now darkening the horizon; the great nations of the West are bound over by present circumstances to keep the peace, and in the East the causes for anxiety are postponed; the value of money in London seems likely to recede, and the activity of trade will require a constant supply of new iron bottoms for its conveyance, however slack shipbuilding may have, for a moment, lately looked; consequently it does not appear to us over sanguine to indulge in cheerful views of the prolonged vitality of the trade in British iron."

IT is stated that specifications are at present in the hands of several Clyde shipbuilders for a new vessel for the National Steamship company. She is to run between Liverpool and New York, and is to be of gigantic proportions, second only to those of the Great Eastern. The dimensions are to be: Length over all, 576 ft.; breadth of beam 50 ft.; depth of hold, 35 ft. It is expected that this great steamship will make the voyage from port to port in seven days.

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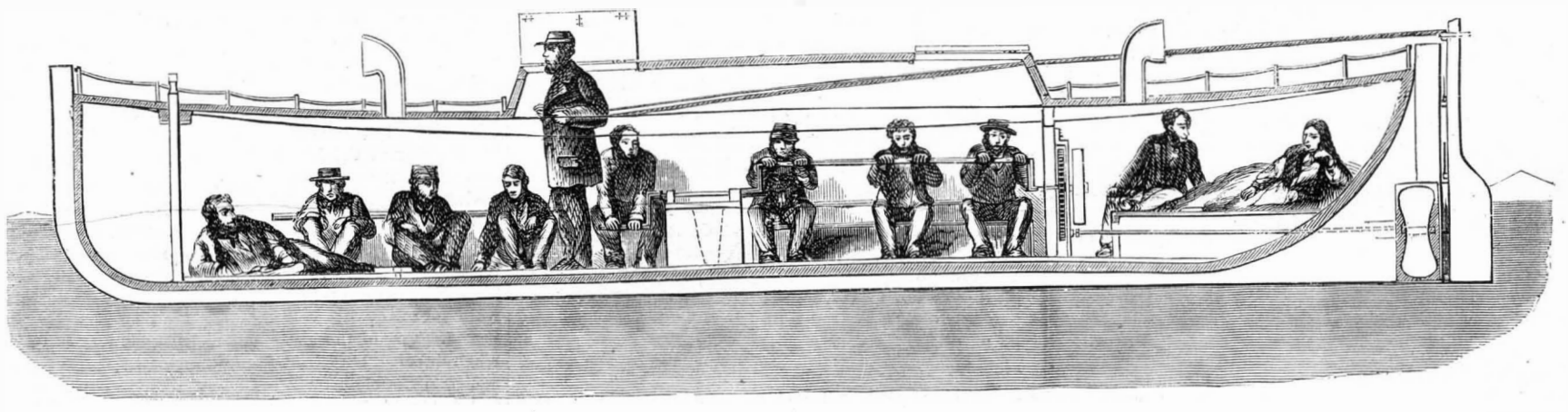
Screw Life Boat.

A very excellent arrangement for a life boat has been invented in England by J. M. Harris, which is shown in our engraving. The exposure of the crews of life boats, and of the persons rescued, to wet and cold is always exhaustive and perilous, and to prevent this is one of the objects of the present improvement.

This life boat is 36 feet long and 7 feet wide; it is constructed of wrought iron and is clothed in cork 5 inches thick. This greatly increases its buoyancy. Its peculiar characteristic consists, however, in the fact that it is entirely enclosed. There are two chambers for passengers, one in the bow, the other in the stern. A third amidships holds the crew. These, four in number, propel the boat by means of a crank connected with a screw in the stern. The helmsman stands in the center and steers the little craft by means of ropes attached to the rudder; and to enable him to see, a little elevation is constructed above the deck, which is provided with glass windows. The chambers of the boat are provided with ventilation by means of pipes which protrude above the deck and catch the air and convey it to them below. The boat represented in our engraving is large enough to hold from twelve to sixteen persons besides the crew. The boat is at the same time very light, is easily launched, and can be drawn on wheels over the land by two horses or four men. The trials hitherto made by this boat have been very satisfactory.



HARRIS' IMPROVED SCREW LIFE BOAT.

ON THE MEASUREMENT OF MUSICAL INTERVALS.

M. Cornu and Mercadier have experimentally demonstrated that musical impressions are based upon several systems of musical intervals.

1. The musical intervals formed by the successive sounds of a melody without modulation belong to the Pythagorean scale, the degrees of which are represented by only the factors 2 and 3.

2. The intervals formed by the simultaneous sounds of the concords, which are the basis of harmony, belong to very different systems, depending upon the complexity of the cords. Those which form part of the simpler concords of two or three sounds, thirds, sixths, perfect concords, etc., may be included in the scale given in all treatises on physics, the degrees of which are represented by the factors 2, 3, and 5.

To demonstrate these propositions, several conditions require to be fulfilled.

In the first place, in the two scales above mentioned, the three different intervals, namely, the major third *do—mi*, the sixth *do—la*, and the seventh *do—si*, differ from one another by the interval called a "comma," the value of which is $\frac{81}{80}$, as will be found on dividing, one by the other, the fractions which represent these intervals on the two scales. Now this value of the comma is very small, though very perceptible to the ear; to demonstrate it we must, therefore, seek the assistance of skilled musicians, and employ apparatus of considerable delicacy.

A wire five, six, eight, ten, etc. meters long, suspended by narrow strips of caoutchouc, is soldered at one end to a small plate of brass, L, placed between the sounding board of a stringed instrument and the foot of the bridge, the other end being slightly clasped to a heavy stand S. Near the fixed point, a small piece of tinsel (*c*) is soldered on, and to this is attached a feather (*b*), by means of a little soft wax (by this arrangement a greater amplitude of vibration is attained than if the feather were directly attached to the wire). The musician stands in such a position that the wire may not impede the movements of his bow, and plays fragments of simple melodies in slow time (each note lasting at least a second). The vibrations of the strings are transmitted to the bridge, the metal plate, the wire, and, lastly, to the feather, which vibrates synchronously. It only remains to trace these vibrations.

The registering instrument is composed of a metal cylinder, M, the axis of which is furnished with a screw moving a double nut, firmly fixed to a table or to the wall. This cylinder is covered with a sheet of paper, which is blackened by making it revolve over the smoky flame of an oil lamp. A tuning fork, D, making from 300 to 500 double vibrations per second, and carrying a strip of tinsel to serve as an index, is firmly fixed in a vice or in the wall, and arranged so that its index may vibrate in the direction of the generating lines of the cylinder. These vibrations serve to mark the time, and the tuning fork serves as a chronograph, obviating the necessity of giving to the cylinder a regular and uniform motion. Further, the feather is moved forward so that its point may just touch the blackened paper, and that it may vibrate quite close to the index, and, like the latter, in the direction of the generating lines of the cylinder.

These arrangements being made, the tuning fork is set in vibration, either with a bow or by striking it with a stick covered with leather, and the musician plays, while the cylinder is turned at a suitable rate either by the hand or by any convenient motive power.

In this manner, a tracing is obtained like that of which a fragment is shown in Fig. 2, each note of the melody being represented by a form of vibration peculiar to itself. The number of vibrations for each note, corresponding to 100 vibrations, for example, of the tuning forks, is counted, and the ratio of the numbers thus obtained gives the values of the intervals. The vibrations are sometimes complicated with harmonics (Fig. 3), but they are almost always octaves, rarely fifths, very rarely thirds; moreover, it is not possible to make a mistake on this point

FIG. 2.

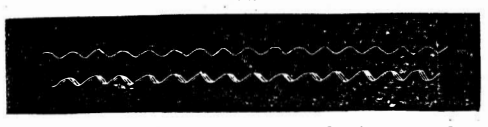
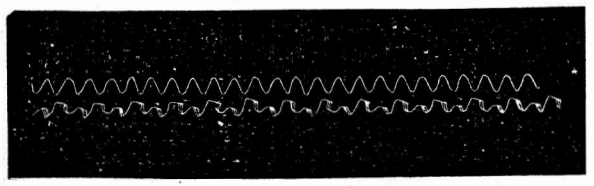


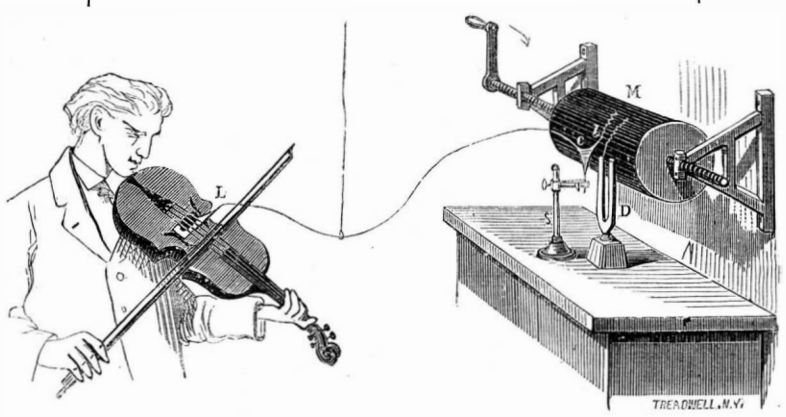
FIG. 3.



To preserve the tracing after it is detached from the cylinder, it is split longitudinally, and dipped for an instant into a 4 per cent solution of shellac in alcohol, whereby it becomes covered with a very thin layer of unalterable varnish.

If, instead of measuring intervals of melody, we wish to measure the harmonic intervals of two sounds, two strings of the instrument are tuned simultaneously (in the ordinary way), to the third, fifth, sixth, etc., till beats are no longer perceptible, and the ear is perfectly satisfied; the sounds of the two strings thus tuned are then separately traced.

FIG. 1.



Sewing Machine Patent Extended.

The Commissioner of Patents has extended the patent of Albert F. Johnson, of New York, for an improvement in sewing machines. This patent is for a rotating rack or hook cam for a chain stitch sewing machine. The extension was opposed by the Gibbs Sewing Machine Company, the question of priority of invention having been long and bitterly contested in the Patent Office. Over 3 600 printed pages and several thousand manuscript pages of testimony were presented to the Commissioner for his examination. In granting the application of Johnson for an extension of his patent, the Commissioner said: "This office cannot, on application for extension by the question of priority, neither can it in the time allowed, properly investigate the question of substantial identity. The question can be properly tried only on the Courts, and I think Johnson ought to have the right to go there. The extension will, therefore, be allowed. The above extension, it is understood, will be granted for the purpose of remitting parties to the Courts where the question if priority can be fully investigated, and is also understood to be adverse to the sewing machine combination.

Manufacture of Sewing Thread.

The cotton is received into the mill in the raw state in bales. The kind best adapted for making thread is that known as the "long fiber" or Sea Island, raised along the Southern and Eastern coasts of the United States; also a similar but somewhat inferior imported staple termed "Egyptian." This cotton is taken from the bales and passed through a machine called a picker, which separates it and passes it out in a downy sheet, and rolls it up into a snow like bundle. It is then taken to the carding machine, where it goes through another separating and refining process, and leaves this machine like a continuous untwisted rope, coiling itself round and round into a circular tin can placed to receive it. From thence it is taken to a French comber, an ingenious machine, the peculiar duty of which is to select or separate the long fibers and reject the short ones, as the long ones only are used in the making of thread. From this machine or comber, it is passed through other machinery or processes of uniting, drawing, reducing, and partially twisting, necessary to its preparation for the spinning frames, upon which it is finally adapted and placed. The spinning frames (or mules, as they are called) are self acting, drawing out the fibers and spinning them into a very fine thread or cord, six of which are twisted together to make the thread, and wind it, when spun sufficiently, upon small bobbins or cops. The spinning frames used in this mill are about 90 feet long, and spin about 900 threads at once. When these bobbins are full, they are taken to a winding machine, and two of these little threads are wound together upon a larger, bobbin. When full, these are taken to a twisting machine the two threads drawn off and twisted tightly together, and again wound upon cops or small bobbins.

This is the first process of twisting, and the second is similar to it, except that three of these twisted threads are wound off and again twisted together, thus making the six cords required to give the strength for which this thread is celebrated.

The thread thus made, says the *British Trade Journal*, is reeled off and tied into hanks or bunches and taken to the bleachery, where it passes through the several different processes of boiling, bleaching, washing, soaping, blueing, and drying; or to the dye house, where it is thoroughly boiled and prepared, and colored by various dyes, the colors being very rich and some of them very costly, the dyes being the aniline colors. When a number of these variously colored spools of this thread are placed together, they present every appearance of silk. After this process of bleaching or dyeing is completed, the hanks are again returned to the mill and wound upon large bobbins, and from these it is finally wound upon the small spools, where it remains until unwound by the busy fingers of industry throughout the world.

Before leaving this subject of thread making, it would be well to speak of the ingenious machines used in the final process of winding the thread upon small spools. These machines work automatically, or, in other words, go through all the motions necessary to wind the thread on the spool, cut the nick, insert and fasten the end of the thread, cut it off, draw off the spool, and drop it into a hopper, completed and well done. It also takes up the next spool, puts it on its spindle, and goes on with its winding. All that is required is simply to feed it with empty spools and collect them when wound. These machines each wind eight spools at a time, or eight spools in a little over a minute of time, or 300 dozen per day. These finished spools are passed through various departments, where they are ticketed, assorted, and placed in paper boxes, neatly labeled, or in larger quantity (assorted) in the drawers of handsome black walnut cabinet cases.

A VERDICT for $30,348 has been returned in the Supreme Court at Northampton, Mass., in favor of the Florence Sewing Machine Company against the Grover and Baker, Wheeler & Wilson and Singer Companies. Other cases, turning on the same question, are pending between these companies, involving about $150,000.

VENTILATION OF SEWERS.—With the view of ventilating the sewers of Glasgow, and destroying the foul emanations from them, the police board have resolved to connect them with several large chimneys throughout the city, including those of Messrs. Townsend, and Tennant and Co., the two highest in the world.

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Correspondence.

The Editors are not responsible for the opinions expressed by their Corr-e spondents.

Small Fast Steam Propellers.

To the Editor of the Scientific American:

The men in our shop were much interested in your account, of vessels of this class now in use in England, in your issue of the 15th inst., having just completed a small propeller which has proved to be very fast, an account of which may interest your readers generally.

The stock yards of this Company being across the Mississippi river, five eighths of a mile from the station, access to them is had with a small steam propeller, the *Robert Harris,* almost exactly like that described in your paper. She is built of oak, 50 feet long and 7 feet beam, and draws about 30 inches aft and a foot forward. She has a locomotive boiler 11 feet long, with fire box 2½ feet by 3½ feet with 27 two inch flues 7 feet long. She has two direct acting vertical engines, cylinders 5 inch bore and 10 inches stroke. Her screw wheel is forward of the rudder, and is 4 feet in diameter and has a quarter pitch. She has a small Seller's injector as well as a force pump. The engines are fitted with the circular slide valve, recently advertised in your paper, and work with extraordinary ease, power and economy of fuel. She will carry 20 to 30 passengers very comfortably.

Originally it was intended to use an upright boiler, such as is used by the steam launches in the United States navy, but the government inspector forbade its use after it was completed, and being pressed for time, a horizontal locomotive boiler was taken, with flues 3 inches apart as the law requires.

From the very limited fire surface and the very long time required to get up steam, an utter failure all round was confidently predicted by the knowing ones. On the contrary, however, our little vessel is a complete success. In speed, capacity, and economy of fuel, she cannot be excelled anywhere. A single shovelful of coal and a stick of wood will send her across the river in less than four minutes, and she will make ten miles an hour up stream or 15 miles down stream, all day, without any extra pushing. A few days ago, she ran a full mile with three shovels of coal and blew off at 100 lbs., as she landed with plenty of steam to carry her back to where she came from. The engineer reports that, though she is twice the size of the boat used last year, he can run her 50 miles with the fuel the other boat would burn in going 20 miles. To-day, interested by your paper, we timed her twice crossing the river. With 55 lbs. of steam and 104 revolutions, carrying 16 passengers, she crossed in 7 minutes. Coming back, with 90 lbs. of steam and 140 revolutions, she came over in 3½ minutes.

Here I would like to say a few words in favor of two excellent devices, the water injector and the circular slide valve. The former, though an old invention, is much less in use than it ought to be. Every locomotive ought to have a pair of them. With this most useful machine, water may be kept up in a boiler without working the machinery at all, and it is really indispensable in every well regulated establishment using steam power.

The circular slide valve is a most promising invention. Exactly what it will do, in gain of power over the common flat slide valve, has not yet been ascertained, but it will certainly do even more than the inventor promises, a gain of one third to one half. The pressure on the valve is completely removed by its use, and with it, the corresponding strain and friction on all the reciprocating parts. I have long been of the opinion that railway master mechanics have gone to a most wasteful extreme with their wide ports and huge barn door valves. If they really wish to know how much power and fuel they are wasting, and how much strain and friction they are thereby creating, for nothing except to make useless labor and expense, a trial of this device will both surprise and undeceive them.

I would like to inquire, of some of your experts in building and running propellers, if such a speed as you name, 600 revolutions, is usual, or if it can be maintained any length of time without rattling the machinery to pieces? High speeds and momentum in high pressure engines seem to be the tendency of the day, but of course there must be a limit somewhere.

Should any of your readers happen this way, I would cordially invite them to inspect our quick, efficient and pow erful little craft, whose success has given us all such satisfac tion. A. GRAY,

Chicago, Burlington and Quincy Railroad, Locomotive Department, Burlington, Iowa.

The Open Polar Sea.

To the Editor of the Scientific American:

The subject of the polar sea is attracting much attention at this time, and I beg leave to submit the following as a scientific consideration:

The whirling of the earth, causing the polar indentations, also drives the water from the poles with a centrifugal force towards the equator; as water, poured on a whirling grindstone or globe, inclines towards the largest circle in the plane of rotation. And as the surface waters are less oppressed by weight above, as the lower waters are, they move more freely towards the equator than the under waters; and while they are passing towards the equator, it naturally creates a counter current towards the poles, for ever rising up at those points like some vast ocean spring, free from ice, till it meets the frozen circle, surrounding the open sea, on its way towards the equator again. Of course this surface current, as well as the under counter current, may be compared to an endless chain in a perpetual motion, for ever rising at the poles; which is, in my humble opinion, the great secret of the open polar sea.

Mr. Morton, of Dr. Kane's expedition, found, in latitude 83° N., open waters moving briskly southward; and the Dutch have lately found open waters warmer than the surrounding air. These facts induce the conclusion that the rapid whirling of the earth produces these two currents; and hence the open polar sea, or ocean spring, perhaps a thousand miles across.

The grand consideration that the whirling world so depresses the polar waters, producing these two wonderful currents and the open sea at the poles, commands our highest admiration and veneration for Him who made all things.

Paris, Texas. J. H. FOWLER.

Iron Ship Building in Wilmington.

To the Editor of the Scientific American:

In an article in your paper for this week, entitled "Iron Ship Building in Wilmington," you state that the Christiana creek is a wide and deep stream which forms a junction with the Delaware River at Chester. The above description is wrong, as the Christiana enters the Delaware River at not less than eleven miles below Chester City, and the yards you mention are several miles up the said creek. But at Chester we have the "Delaware River Iron Ship Building and Engine Works" (formerly the Reaney Engineering Company), now employing between 700 and 800 workmen, with four large iron ships on the stocks, and one just launched. Two are for the Pacific mail service. The yard is the largest in the country, and its business facilities are unequalled. It is situate directly upon the Delaware, having a river frontage of 65 feet. The Delaware is, at this point, one and one half miles from shore to shore. The principals are John Roach and Sons, formerly of New York.

Feeling great pride in our rapidly growing city of 12,000 inhabitants, we do not like to be confounded with Wilmington or Philadelphia; but being just between the two, we intend to stand on our own bottom and build iron ships against the world.

Chester, Pa. N. RULON.

Molasses or Hydrochloric Acid for Flowers.

To the Editor of the Scientific American:

Several years ago I became passionately fond of flowers, and I purchased a great many. I gave them all the attention I could possibly spare, and watched over them anxiously for a long time; but I found to my disappointment that before several weeks had passed, they all suddenly assumed a poor and dying appearance.

I changed the earth, enlarged the pots, and did everything imaginable, but they did not seem to improve at all. About this time, I removed the earth around the roots of a favorite geranium, and pouring molasses (the unrefined will serve the purpose well) around the roots, I covered it up with earth, and waited patiently for a change. You would have really been surprised to have seen the great improvement in the flowers. I tried several others with the same result.

If any one thinks that molasses is too expensive to be used for such a purpose, I would assure him that hydrochloric acid answers equally as well. It should be diluted in water (say one ounce of the acid to three or four quarts of water), and the flowers should be washed with it at the usual time. If these simple facts are of any value to lovers of flowers, I trust this will be made public. E. S. G.

Philadelphia, Pa.

HORSE HAIR.

Horse hair is brought to this country from South America, Siberia, and portions of Europe. The greater part of all imported comes from South America, being obtained from the immense numbers of horses, which, in a wild state, roam over the pampas of that continent. The manes and tails of horses which die in this country, although contrary to popular supposition, form but a small portion of the supply; the hair thus obtained is generally of poor quality, and unfit for use in the manufacture of hair cloth.

The material is imported in bales weighing about one thousand pounds each. These contain either "mixed hair," that is, hair of different lengths, or else are filled entirely with long hair. The former variety is the cheapest, costing in the bale from thirty-five to forty cents per pound in gold; the latter averages about seventy cents. As the material in its raw state is in a tangled and dirty condition, the first process through which it passes is sorting, during which the different colored hairs are placed in separate heaps. This work is done by boys, and its object is to facilitate the subsequent dyeing, as the black stain used is much more readily imparted to hair that is naturally of a dark color than to that of the lighter shades.

The bundles of sorted hair are then hackled, by which process the hairs are made straight and the foreign substances and dirt mingled with them removed. During the hackling, great care is taken not to break the hair, as upon its length its value depends—long hair being much more scarce than the shorter varieties and consequently far more costly.

A number of tufts of hackled hair are next placed between the teeth of a couple of cards. The latter, as our readers are doubtless aware, consist simply of flat pieces of tough wood on which pointed spikes of steel of about three inches in length are inserted. One of these cards is placed on its back on a table and the bundles of hair laid side by side between its teeth; when this card is full, the other one is placed upon it, points down, so that the bundles are firmly held by the double set of spikes. The hair, it must be remembered, is still of different lengths, and it is the object of this carding to arrange the long and short hairs in separate bundles.

The workman, therefore, begins by pulling out, from the bundles between the cards, all of the long hair in the ends nearest to him, and then keeps on removing more and more, until the set of extremities at which he is working are perfectly even, no one hair projecting more than another. Then he fastens the ends, removes the upper card, reverses the bundles and repeats the same process with the other extremities. When he finishes, the hairs between the cards are all of exactly the same length, and the separate tufts are now ready either to be made into curled hair, to be sold to the brush makers, or to be woven into hair cloth.

Curled hair is the material generally used for stuffing mattresses, cushions, etc. Other substances are occasionally employed for the purpose. Moss, sponge, sisal, (a species of Manilla hemp), African fiber, excelsior, (a fancy name applied to a preparation of wood shavings), tow, and a vegetable fiber from California known as eureka, are the most common; but none is as durable, cleanly, or elastic as pure curled hair.

The process of curling is begun by making the lengths of hair which are found to be too short for other uses into a rope. The workman, taking a bundle of loose material in his hand, attaches it to a revolving hook and, walking backwards, continually adding more hair, spins a long, tight strand. Two of these strands are twisted into a cord which, when finished, is reeled up into large coils. It is then boiled and immediately afterwards baked, this process setting the "kink" in the hairs, rendering them thoroughly elastic. In this condition, curled hair is sold to the trade; it only remains to untwist and pick out the rope by hand to obtain the desired quantities. The present price is for the pure material from forty-five to sixty cents a pound, according to quality. In the manufactory, one workman can make up from two hundred to two hundred and fifty pounds of curled hair per day.

Hair cloth, principally used for covering furniture, is manufactured from the longer and better qualities of hair. The bundles of hair, destined to be made into cloth after being carded in the manner above described, are removed to the dye house. There they are attached to a large iron grating which, when filled, is lowered into a vat of boiling dye, in which it remains for about five hours. The hair is then detached, and is ready for weaving.

This work is done by girls. The warp of the cloth is of black cotton thread. Linen thread is a better material, but makes a stiffer and harsher fabric, less suited for upholsterers' uses.

The hair composes the weft, and its length depends upon the width of cloth to be made, the usual proportion being a thirty-five inch hair to a thirty inch cloth. Each hair is introduced separately, being caught in a long shuttle or rod, the end of which terminates in a catch hook. The shuttle enters the shed of the warp, and the weaver, with her left hand, hooks the hair into the catch hook which draws it through to the other side. The batten is then driven home, and a new shed opens. These movements are made with great rapidity; and as the threads of hair must be fastened to the shutter bar with mechanical regularity, it is only after long practice that the requisite skill is attained. Formerly, two weavers were required to every loom, one to hand the thread and the other to fasten it to the shuttle; but the improved machines at present in use are easily managed by one person. We learn that still further improvements have been lately made, so that one workman can attend to six machines, the thread being attached to the shuttles, and the other work now done by hand accomplished entirely by automatic appliances.

After leaving the loom, the cloth is pressed between hot metal plates, and afterwards rubbed to give it the necessary polish. As furnished to the trade it is generally black, and its principal use is, as we before mentioned, for covering furniture. A very fine variety is sometimes made for sieves, and another quality is used by ladies in order to give volume to certain portions of their attire.

In price, hair cloth averages about one dollar per yard, varying from forty-five cents to two dollars and seventy-five cents. In width, it is manufactured in all sizes between fourteen and thirty-two inches. It is largely imported into this country, although it is estimated that the home manufacture amounts to over 20,000,000 yards, yearly.

A Lecture on Thomson's Galvanometer.

DELIVERED TO A SINGLE PUPIL IN AN ALCOVE WITH DRAWN CURTAINS.

The lamp light falls on blackened walls,
And streams through narrow perforations;
The long beam trails o'er pasteboard scales,
With slow decaying oscillations.
Flow, current! flow! set the quick light spot flying!
Flow, current! answer, light spot! flashing, quivering, dying.

O look! how queer! how thin and clear,
And thinner, clearer, sharper growing,
This gliding fire, with central wire
The fine degrees distinctly showing.
Swing, magnet! swing! advancing and receding;
Swing, magnet! answer, dearest, what's your final reading?

O love! you fail to read the scale
Correct to tenths of a division;
To mirror heaven those eyes were given,
And not for methods of precision.
Break, contact! break! set the free light spot flying!
Break, contact! rest thee, magnet! swinging, creeping, dying.

$\frac{dp}{dt}$ *in Nature.*

EXTENSIVE deposits of crystalized sulphur have been discovered in the Beaver Mountains, three hundred miles from Salt Lake City.

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NITROUS OXIDE OR LAUGHING GAS.*

Aeriform or gaseous substances were not recognized as material bodies until the middle of the 17th century, and it required the lapse of another 100 years, together with the discovery of the barometer by Torricelli and of the air pump by Guericke, before the fact of their materiality was accepted. Since that time, the vaporous and gaseous bodies have occupied a most important position among the forms of matter presented to the chemist for investigation.

Nitrous oxide was discovered by Priestly in 1776, and was minutely examined by Davy in 1805.

It may be prepared by two or three processes, the easiest of which is by heating nitrate of ammonia, $NH_4 NO_3$, which is, by the action of heat, entirely split up into nitrous oxide and water, thus: $NH_4 NO_3 = N_2O + 2 H_2 O$.

The salt puts on the appearance of boiling, this being due to the continuous evolution of gas in the form of small bubbles. In preparing nitrous oxide by this method, care must be taken that the temperature does not rise too high, not above 240° C., or other compounds will be formed, particularly nitrite of ammonia, $NH_4 NO_2$, this taking place sometimes with explosive violence. Another method of preparing the gas is by acting upon zinc with very dilute nitric acid, when the acid is reduced at the expense of the zinc, and very pure nitrous oxide is slowly evolved.

Nitrous oxide will not support combustion, but as it is decomposed by a moderately strong heat if a combustible be introduced into it in the state of strong ignition, decomposition of a portion of the gas will ensue, and the liberated oxygen will continue to support the combustion.

Thus the feebly luminous, not over hot flame of burning sulphur is extinguished on introduction into an atmosphere of nitrous oxide, but burning phosphorus or a glowing splinter of wood, having a higher temperature, not only continues to burn, but burns with considerably increased brilliancy, owing to the freeing of the oxygen.

In the same way, the gas will not support life, although it may be breathed for a short time, as first shown by Davy, producing thereby a stimulating effect upon the system, which originated its name of laughing gas.

Nitrous oxide is further remarkable for its extreme density, being half as heavy again as atmospheric air, and possessing a specific gravity identical with that of carbonic acid gas, the choke damp of mines.

The gas may be poured from one vessel to another through the air as a liquid, or it may be baled, or siphoned, or otherwise transferred, in very much the same way as a liquid. A layer of a lighter gas will remain on the top of it for a considerable period with very little mixture, and for this reason it may be collected by what is called displacement, the tube, delivering the gas, dipping to the bottom of the collecting vessel.

Nitrous oxide is not a permanent gas—that is to say, does not remain gaseous in all circumstances; under extreme pressure, it gives way and becomes a liquid. No doubt this is true of all gases whatsoever, and our present limitation is due only to our inability to carry our experiments sufficiently far; but be this as it may, there are at least six gases that have up to the present time resisted all efforts to convert them into the liquid state. They are:—hydrogen, oxygen, nitrogen, carbonic oxide, marsh gas, and nitric oxide, and these are therefore called permanent gases.

Gases may all be looked upon as the unsaturated vapors of liquids, having their boiling points very far below any ordinary temperatures; as these boiling points are approached, they become more and more nearly saturated, until a point is reached at which a further reduction of temperature or increase of pressure will cause a condensation of some portion of them to the liquid state.

To illustrate this, we may refer to the case of ordinary water gas or steam, where, by the boiling of water, a vapor is given off; and so long as the vapor is kept above the boiling temperature, it exhibits the properties of a true gas, but the moment the heat falls below this point, or what comes to the same thing, external pressure is applied, a portion or the whole of the steam returns to the liquid state.

With respect to water, this may be rendered perfectly evident, but with other bodies, with much lower boiling points, extreme pressure and sometimes great cold have to be applied in order to obtain any condensation to the liquid state. Ether boiling at about the temperature of the body exists as vapor in the tropics, which may be liquefied by a pressure of one atmosphere (in excess of the ordinary atmospheric pressure) or an additional 15 lbs. per square inch.

Sulphurous acid gas requires a pressure of four atmospheres or 30 lbs. per square inch in order to liquefy it at ordinary temperatures (about 15° Cent.).

Cyanogen.....	6	atmospheres or	90	lbs	per	square inch.
Ammonia.....	8	"	120	"	"	"
Carbonic acid..	36	"	540	"	"	"
Nitrous oxide..	40	"	600	"	"	"

This condensation of nitrous oxide was first effected by Faraday, who compressed the gas into a glass tube by means of a condensing syringe.

The boiling point of the liquid was determined to be —125° Fah., or very nearly as far below the freezing point of water as the boiling point is above it.

A clear mobile liquid of slight refractive power is the condensed nitrous oxide.

Its liquefaction is now carried out on a somewhat extensive scale since its introduction into surgery as an anæsthetic. For this purpose steam power is found requisite, and the gas is compressed by well made very strong forcing pumps, into specially made wrought iron bottles.

During its compression much heat is evolved—squeezed, so to speak, out of the gas—the heat required to maintain any gas in the gaseous condition being very much in excess of that necessary to maintain it in the liquid state.

When liquefied on the large scale, the receivers have to be kept cool by the external application of ice cold water, in order to prevent the vessel heating to a dangerous extent.

Upon its re-conversion into the gaseous form by simply removing the pressure, this heat is re-absorbed from surrounding objects and from the air, thus giving rise to an intense degree of cold—a cold so great as to be far below the recordings of any trustworthy thermometer,

No gas has yet been solidified by direct pressure, but this has been accomplished in many cases by cold. Sometimes, as in the case of carbonic acid gas, the evaporation of a portion of the liquefied gas, on relieving the pressure, reduces the temperature of the remainder of the liquid to such an extent that it freezes readily. The frozen carbonic acid is a snowlike porous mass, passing directly into the gaseous state without becoming liquid. Nitrous oxide can only be solidified under the greatest difficulty, and when frozen presents the appearance of a glassy mass of solid ice, rather than that of snow.

Mercury, freezing at a temperature of —40° Fah. is readily solidified in quantity by the liquid nitrous oxide.

Water possessing a high specific heat, dropped into the liquid, occasions a kind of explosion on account of the liquid's very sudden conversion into gas.

Ignited charcoal may be placed upon the surface of the liquid with impunity, when it floats about burning vividly in the decomposed gas; this phenomenon is explained by the fact of the liquid being in the spheroidal condition, and thus preventing the ignited mass from coming into contact with itself by maintaining a layer of gas between them.

When liquid nitrous oxide is mixed with bisulphide of carbon to promote its evaporation, the lowest known temperature is obtained, namely —220° Fah.; at this temperature, alcohol, although not frozen, becomes so viscid that the vessel containing it may be inverted, the alcohol remaining attached to the interior.

The physiological action of nitrous oxide has been purposely left out of the foregoing observations; sufficient is not at present known even to give rise to an acceptable theory.

It would seem, also, that before any investigation could be entered upon, with any hope of success, with regard to the action of anæsthetics, it would be necessary to demonstrate how and in what manner sensations are transmitted along the nerves.

A suggestion here occurs as to the possibility of these transmissions taking the form of undulations or vibrations of extreme rapidity; and if this be the case, it is quite conceivable that two or more vibrations, proceeding at unequal rates, may so interfere as to give rise to a partial or complete suspension of the sensations: just as in the analogous cases of light and sound, waves proceeding at different rates will so interfere or neutralize each other, as to result respectively in a period of darkness or an interval of silence.

The part then played by an anæsthetic would consist in setting up these counter vibrations, whereby the pain-producing undulations would be neutralized or quenched.

*From a paper read by Francis Woodhouse Braine, F.R.C.S., before the Odontological Society, London.

Educated Railroad Men.

If a lawyer's argument is fallacious, says the *Railroad Gazette*, the opposing counsel is very apt to show it up with disagreeable clearness; a merchant's views of justice are tempered by the claims of those he deals with, and an editor's opinions, if assailable—or even if they are not—are sure to be attacked. A master mechanic's opinions are, however, seldom questioned. Those under his authority are usually anxious to obtain his good will, and therefore do not venture to dissent. The men whom he meets in the transaction of business are only too anxious to produce in him a feeling of complacency, so that often, year by year and quite unconsciously, such a person acquires the habit of esteeming his own opinions, and attributing an absolute authenticity to them. Most of us who have any considerable acquaintance with master mechanics, or other railroad officials occupying similar positions, know such men—men whose minds are as impervious to the absorption of a new idea from another as a cabbage leaf is to the morning dew.

Now the surest preventive of this condition is a liberal education. No man can acquire the mental training which a liberal education implies without constantly assuming an attitude of submission to the ideas of others in the attempt to make them his own. Let any person try to comprehend a difficult book, and he will find that, to do so, he is obliged, for the time, to a greater or less extent, to suspend, as it were, his own intelligence, and submit his mind to the influence of the writer of the book he is reading. The constant habit of doing this finally becomes a sort of constitutional mental habit, and becomes the distinctive mental difference between educated and uneducated people.

For this reason, an educated person is almost sure—other things being equal—to take broader views than the man whose opinions are limited by his own observation. This fact is beginning to be recognized more and more by people who have money to invest or expend in engineering projects, and one of the leading and most successful engineers and manufacturers in Philadelphia not long since told the writer that it has been found, among manufacturing engineers, that establishments and firms which employed educated men for managers succeed, and those who employed men who are not educated did not. The Pennsylvania and some other railroad companies have adopted the policy of placing a number of educated young men in subordinate positions, so as to give them opportunities of acquiring the practical experience which will fit them for those which involve more responsibility. In other words, they find by experience that men with a good scientific education make much better executive officers than those without, who are only practical men.

Of course, it would be utter folly to assume that practical experience is not necessary. Of the two, we believe it is more requisite than purely theoretical knowledge, and that an engineer without it is simply no engineer. What we are contending for is the combination of the two.

In this connection, it is to be regretted that there is not some systematic effort at co operation between the scientific schools and railroad companies. Let it be known that a student who graduated high in his class would be sure of remunerative employment, either on a railroad or in some engineering establishment, and such appointments would become prizes which students would strive to deserve. It would thus be distinctly understood that the study at the school is only preparatory to the actual experience and work, and in no sense enables a young man to do more than make a fair start in his profession. We doubt whether any of our railroad companies could do a more effectual thing to improve their service than to make a standing offer to employ, each year, from one to a dozen of the best graduates of any of the technical schools of the country, with remunerative compensation. The conduct of the student while at school should, of course, be part of the test, as well as his acquirements.

Of the class of men who pride themselves most on being practical and ignorant of theory, there is of course no hope, nor is there any danger of giving them offense; because such will not read what we write, or anything else. They rest entirely satisfied with their own opinions and knowledge, and there we must leave them; but to young men who started in the world with few of the advantages which a liberal school education can give, we can only say that it is not the school which makes the teaching valuable, but the knowledge gained. There is no high tariff on knowledge in this country and you at liberty to "stake off" as big a "claim" and work just as deep in any vein of it as you choose. That from which you have most to fear is indifference. So long as you do not care whether you are learning or not, your case is hopeless.

Preparing Telegraph Poles.

When the telegraph system of England was transferred to the Government, arrangements were made with various contractors for providing the trees necessary for supplying the demand of the prospective increase of telegraphic communication. In the North of Ireland, Messrs. Hamilton, of Cookstown, were the contractors, and a glance at their process of manufacture may not be uninteresting. The preparation of the trees which are to serve as telegraph poles is under the superintendence of a Government official, and a large staff of workmen are engaged in the process. The manufactory, as it may be termed, is situated in the middle of an extensive field, and consists, in the first place, of a quadrangular structure, four strong poles, some 60ft. in hight, forming the angular points. Within 6ft. of the top is a platform, on which are two or three vats, each capable of containing 200 gallons. In the bottom portion of this structure are pumps for the purpose of forcing a liquid, chemically prepared, into the vessels above. The principal ingredient, besides water, is sulphate of copper. From these vessels, two systems of tubing are carried downwards to the ground, and continued along the surface forward to a distance of a couple of hundred yards, in a direction at right angles to the front of rectangular structure already mentioned. Raised at a slight elevation from the ground and placed at right angles to these tubes, lie the trees to be operated upon, with their thicker ends inward; at intervals of 12in. or 15in. in this horizontal tubing is placed a series of taps, each connected by a short india rubber tube to the end of a tree, to which it is secured by means of cramps and screws, and rendered watertight by a sort of nozzle. By means of cocks at the upper end of the horizontal piping, the solution in the vats is permitted to descend. The pressure exerted from above forces it into the pipes through the india rubber tubing and into the trees, traversing them in the direction of their fiber. In a short time, the sap and a portion of the chemical solution are seen to ooze slowly from the smaller end of the tree, where they fall into a sort of wooden gutter, inclined at such an angle as causes them to run back to a cistern near to where they had been originally prepared. After undergoing some filtration here, it is placed along with the yet unused liquid, and again performs the circuit of the vats above and trees below. The time necessary for the complete saturation of the trees varies from ten days to three weeks, according to their quality and age. In this way, an application of the principles of hydrodynamics, combined with what is little more than a mechanical chemical knowledge, enables the manufacturer to provide poles for telegraphic purposes which will resist the action of the atmosphere for at least five times as long as the telegraph poles formerly in use.—*Engineer*.

IN the New England States, as appears from carefully prepared official statistics, eighty per cent of the criminals have little or no education; eighty to ninety per cent never learned a trade or understand skilled labor; seventy-five per cent of the crimes are committed by persons of foreign extraction; eighty to ninety per cent of the criminals are intemperate; ninety-five per cent of the juvenile offenders are the offspring of idle, ignorant, vicious, and drunken parents.

IN Australia, spring begins August 20, summer, November 20, autumn, February 20, and winter, May 20.

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BERRYMAN'S FEED WATER HEATER.

One of the *desiderata* in the economy of the steam engine is the utilization of the heat which is ordinarily carried off by the exhaust steam and wasted. Of many inventive efforts in this direction, we know of none which promises success in so high a degree as the feed water heater which our engravings illustrate. It is the invention of Mr. R. Berryman, of Hartford, Conn., and was patented by him April 9, 1872. It has been in practical use for more than a year in various manufactories where its good qualities have been fully tested, and Government has lately ordered one to be furnished for the purpose of investigating its merits.

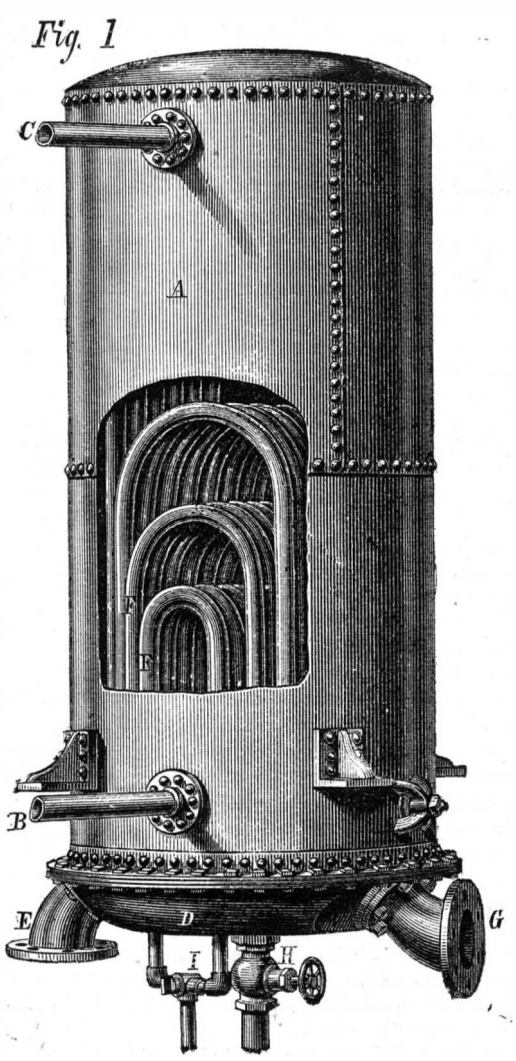
Fig. 1 represents the heater with a portion of the shell broken away so as to show the position of the steam pipes within. A is a cylinder which contains the feed water, B being the induction, and C the eduction pipe. The exhaust steam enters one side of the chamber, D, through the pipe, E; it is thence conveyed by the tubes F to the other side of the chamber, and passes out through the pipe, G. H is a blow off cock connected with the feed water cylinder, and at I are two drip pipes, each of which is connected with one side of the exhaust chamber, D. The construction of the water cylinder, which is made strong enough to withstand the working pressure of any steam boiler, will be understood readily from the engraving; that of the steam apparatus we now proceed to explain. Fig. 2 shows the tubes connected with the tube sheet, J. The tubes used are seamless brass of the best quality. They do not pass through the sheet, but rest upon a shoulder formed in boring it, and are there expanded or set up as shown in detail in Fig. 3. A sufficient number of tubes are employed in each heater to obtain an area, in the aggregate, twenty per cent greater than that of the exhaust pipe of the engine for which it is intended. The exhaust chamber, D, is formed by joining the flanges of the tube sheet, J, and plate, K, which latter forms the bottom of the chamber. These two flanges are again joined with the flange on the lower end of the water cylinder, and the three are securely bolted together in the manner shown in Figs. 1, 4 and 5. This exhaust chamber is divided into two spaces by a partition shown in Fig. 4, which is formed by a rib cast on the under side of the tube sheet, and a corresponding rib which projects from the upper side of the bottom plate. In Fig. 5, which is a sectional view taken at a right angle with Fig. 4, are shown the two divisions made by the ribs, and the course (indicated by arrows) which the steam is thereby compelled to take. It will be observed that the tube sheet, J, forms also the bottom of the water cylinder, and that it is made concave on its upper surface. By this construction, the deposits made by the feed water tend to collect at the center, and can readily be blown off from the cock, H, which is connected with the water cylinder by a pipe passing through the exhaust chamber and shown in Figs. 4 and 5. During working hours, the blowing off may be advantageously effected by the pressure exerted by the feed water while being forced through the heater. At other times a hand hole, seen in Fig. 1, can be opened and the bottom cleaned out. The water formed by the condensation of steam in the tubes is carried off by the drip pipes, I, and is not used again under any circumstances on account of the grease contained in it. In some heaters, the feed water is brought into direct contact with the exhaust steam, and, in consequence, becomes charged with the grease employed to lubricate the cylinder. This, when carried into the boiler, has been known to cause burning by allowing the metal to become overheated, besides giving rise to a large consumption of fuel. Further, the steam generated from such water proves very injurious in many branches of manufacture. In woolen mills and dye houses, for this reason, the heater now described is very valuable.

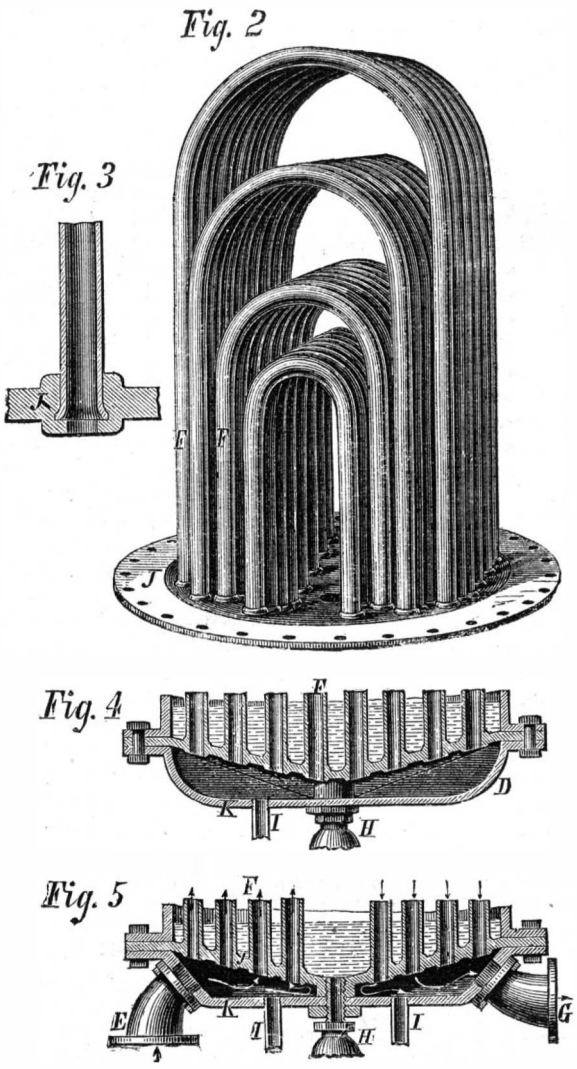
Two heaters may be used, if desired, in combination; in which case the first could be employed solely to heat the feed water for the boilers, and the second to condense the surplus exhaust steam which would pass into it; sufficient water, of course, being drawn from the second heater to keep the temperature low enough for condensation.

Among the advantages claimed by the inventor for this form of heater are the following: The ability of the steam tubes to expand and contract with varying temperatures without causing the damaging strains to which heaters that are constructed with tubes fastened in both heads are subject; the capacity of the heater for containing a large quantity of water, which insures sufficient time for it to become settled and thoroughly heated before being fed to the boiler; the arrangement of the supply pipe and feed pipe (the first being near the bottom of the heater, but far enough distant from the constantly collecting sediment to create no disturbance in it, and the second near the top) which results in supplying the boiler with pure water at a maximum heat; and the facilities for cleansing the heater. He states that the feed water reaches the boiler at a temperature of 212° F., and that this high result is consequent on the large amount of heating surface obtained and the constant passage of the exhaust steam through the tubes, which takes place whether the boiler is being fed or not. There is no place in which the water of condensation can lodge in the tubes, and there is, therefore, no loss of power, which would otherwise be incurred in driving it through them. He thinks the employment of the heater on river and coast steamers, where steam at a high pressure is used, would greatly increase the safety of the boilers, while its application to the low pressure condensing engine will supply a long felt want. An engine of this character was supplied with one which was placed between the cylinder and the condenser, and the feed water was heated by the exhaust steam nearly to the boiling point before the latter entered the condenser. Generally a great saving in fuel and repairs is expected to be gained by the use of the heater.

Mr. Berryman is the inventor of other well known machines devised in view of the safe and economical working of steam boilers, some of which have previously been illustrated in the SCIENTIFIC AMERICAN.

Further information may be obtained of the Berryman Manufacturing Company, Hartford, Conn., or at 36 Cortland street, New York city, where the heater may be seen in operation.





ICE PRESERVER.

This invention consists of a cylinder which may be placed over a pitcher or other vessel wnich it is derived to keep cool.

It is made of sraw, woolen or cotton felt, or kindred material, and lined within and covered without with flannel. The inner lining is preferably of white. The top is made of wood to give form to the cylinder, and has a handle for convenience in raising it. Previous to lining with flannel the felt or kindred material, of which the cylinder is made, is coated with shellac or varnish, by which the pores are closed and its utility is increased. A rubber tube around the bottom is an advantage, as it adapts itself to the inequalities of the surface upon which it rests and excludes the air.

Mr. James Dunning, of Bangor, Maine, is the inventor of this improvement, which makes its appearance in good time for the summer demand. There is no doubt its use would prove very economical in the preservation of ice, and water taken from springs or wells, cold enough to be used without ice, might be kept cool much longer by its employment than when exposed in an open vessel. The invention will also serve to keep hot the heated contents of vessels, where it is desirable to apply it to such a purpose.

Volta-Induction.

1. In a secondary closed circuit, the excited induction current is proportional to the current strength in primary circuit.

2. The induction currents arising from the action of a galvanic current upon itself are, both on breaking and making the circuit, equally great, so long as the inducing current strength remains equal.

3. When a metallic closed circuit and a conductor through which an electric current is circulating are either brought nearer each other or separated, a current is induced in the metallic closed circuit. This current is in the reverse direction to that which would have been necessary to effect the approach or separation of itself.

4. The electromotive force which a magnet excites in a helix of wire is, *cæteris paribus*, proportional to the number of convolutions of the wire.

5. The electromotive force which a magnet excites in a surrounding helix is equal, whatever may be the radius of the coil. Therefore, the currents induced in the different rings of wire are inversely proportional to their diameters.

6. The electromotive force excited by a magnet in a helix of a given number of turns is the same, whatever may be the thickness or conducting power of the wire.

7. The strengths of the induction currents in different spirals of equal number of turns are proportional to their conducting powers.

8. The longer the connecting wires are, so much more numerous should be the convolutions in order to obtain a maximum current.

9. The more turns which can be put next to each other close by the magnet or magnetized armature, the fewer turns will be necessary to give a maximum current.

10. The maximum of an induction current is proportional to the strength of the inducing magnet.

11. The retardation of the development of magnetism, in soft iron cores which are wholly covered by helices, depends principally upon the opposite currents induced in the helices themselves. The magnetism of the simultaneous currents induced in the periphery of the core, and the coercive force of the iron, are of less influence.

12. The retardation of the disappearance of the magnetism, from soft iron cores which are wholly covered with galvanic helices, depends, however, principally upon the formation of currents in the periphery of the soft iron cores.

13. The retardation of development and disappearance of magnetism, in soft iron cores which are only partially covered with helices, depends principally upon the magnetic inertia of the iron.

Hydro-Electric Submarine Cable.

M. Ferdinand Tommasi, 69, avenue de l'Alma, Paris, an engineer and inventor of considerable eminence and repute, has just perfected an invention under the above title, which is attracting attention and likely to excite considerable interest. He proposes to employ it for submarine telegraphy, and to substitute, for the ordinary electric conductor, the cable, a simple tube of copper, containing as it were a thread or column of water, which is stated to transmit effectually and instantaneously every impulse communicated by pistons, and not only that, but to permit such impulses to be transmitted in opposite directions at the same time. M. Tommasi's experiments have been conducted upon a limited scale, but he affirms that he can absolutely obtain the following results:—1. A speed of transmission of 600 signals per minute, even at 4000 kilometers distance (nearly 2,500 miles English). 2. Simultaneous exchange of correspondence, any number of despatches being effected at once by the same cable. 3. Adaptability to any recording instrument whatever, the dial, Morse, printing, etc., quite automatically. 4. Economy in first cost, durability, and increase in returns.

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WEIGHT, PRESSURE, FORCE, POWER, ENERGY, WORK.

We have, in our last number, page 415, considered the difference between the conceptions formed from the first three of these names; we will now devote a few remarks to the latter three.

Weight and pressure, when expressed in numbers of units, can, as we have seen, represent strictly nothing but an amount of matter; in order to pass to a higher conception—force—another element must be introduced, that of space, in which matter may move; if this space is measurably large, and the molecules move in mass, we have what we commonly call motion; if the space is immeasurably small, and the molecules move separately, either in vibratory, oscillating, rotating, or any other hidden motion, we have one of the so-called imponderable forces, heat, electricity, etc., which are only different active conditions of ponderable matter.

In order, now, to pass to a still higher conception—power—we must introduce again another element, that of time. To express, for instance, a so called horse power, it is not enough to state that it is equal to 33,000 foot pounds, or 33,000 lbs. lifted one foot high against gravitation. A man may do this by means of proper contrivances, or simply by subdividing the 33,000 into 300 separate pieces of 110 lbs.; and if employing two seconds for the lifting of each, it will then take him 600 seconds or 10 minutes to raise the whole 33,000 lbs. one foot; but he could not possibly perform this job in one single minute, even with the most ingeniously contrived mechanical arrangements. Experiments have shown that an average horse can do this, and therefore the formula has been adopted that a horse power is equal to lifting 33,000 lbs. one foot high in the time of one minute, or 33,000 foot pounds per minute. We see thus that, for the conception of power, in the most commonly accepted sense of the word, we want the three elements, weight, space, and time, combined.

It is evident that the heavier the moving mass and the greater the space through which it moves, the greater is the power; but also that, inversely, the shorter the time is, the greater is the power, and this exactly in the inverse ratio. So 60 horse power can raise 33,000 lbs. one foot in one second, and 7×60, or 420 horse power in one seventh of a second. If the hight is increased, the time must be increased in the same proportion in order to perform the work with the same amount of power. Suppose, for instance, that we wish to lift 33,000 lbs. of water 170 feet high; we must multiply the time with 170, which, in the latter supposed case of 420 horse power, would give $170 \times \frac{1}{7}$ of a second, or 24 seconds, nearly; 420 horse power will thus lift 33,000 lbs. 170 feet high in 24 seconds, or 150×33,000 lbs. in 150×24 seconds, which is 4,950,000 lbs. per hour, and 237,600,000 lbs. in 48 hours. If this weight is water, it is very near 30,000,000 gallons, and is exactly the duty performed by the lately built steam engine at the Ridgewood waterworks, in Brooklyn, which is of 420 actual horse power, and lifts, every 48 hours, 30,000,000 gallons of water into the reservoir 170 feet above the lake from which the water is raised.

The water thus raised is a power stored up, a potential energy, if we wish to use a learned expression introduced in the mathematical considerations of mechanics; in common language, it is work performed, and we may again get work out of it, as is done in a few churches in Brooklyn, where the pressure of this very same water works the bellows of the organ, and thus dispenses with the blower—a very proper improvement, as the blowing of an organ is a very unsuitable work for a man, especially on a hot Sunday.

To recapitulate: Weight and pressure are nothing but the results of a certain amount of matter acted on by gravitation, the latter giving the means of measuring it; another measure of matter could be founded on the space which the bulk of the matter occupies; but, as this is exceedingly variable for the same amount of matter, we are compelled to resort to gravitation, and the resultant weight is the most absolute of material measurements. Besides, no stereometric instrument (that is, one by which we determine the bulk of any substance) can compare at all in delicacy and accuracy with the balance by which we determine weight.

Force, if we wish to give only a single meaning to this word, and the one most in accordance to its etymology, is the product of mass or weight with space. It is very unfortunate that this word has been introduced in the treatises on mechanics in a not properly defined manner, mostly as identical with weight, as evidenced from the method of measuring force by weights or pressure, and speaking, for instance, of a force of 50 lbs.; at another time force is called "the agent which drives machinery." Neither of these should be called force. In the first case, we should say "of a weight or pressure of 50 lbs.;" in the second, we should speak of the "power driving the machinery."

In defense of the method of measuring force by weight, it may be said that weight or pressure is not matter, and this is true; but it is simply a result of a certain amount of matter acted on by terrestrial gravitation, and as such is dependent on matter, namely: first, on the mass itself; next, on the mass of the Earth; and, finally, on the distance from the Earth's center. If, now, gravitation produces motion in a body, we have force; if not, we have not an actual force, but we have force stored up, or potential energy. Such is the case with the planets, revolving around the sun and kept at their respective distances by the tendency of matter to move in a straight line, very improperly called centrifugal force. If the latter agency ceased, the gravitation would act freely and produce an accelerating motion toward the sun; and finally, when this motion of the masses ceased by reaching the sun, it would be converted into molecular motion, heat, raising the sun's temperature still higher. No doubt that the sun's present heat once originated in the same manner, and is thus a result of gravitation.

The cause that our mechanical text books, the best in existence not excepted, do not give properly defined meaning to the words in question is that mechanical science is much older than the true conception of what really constitutes force. The attainment of this conception was reserved to quite recent times; and it is amusing to see how many, even at the present day, envelope themselves mentally in a fog by their inability to ascend to the modern conception of force as matter in motion, still clinging to the old idea that it is something etherial, independent of and separate from matter. It is not surprising that, in that period of time when all the functions of life were not yet biologically proved to depend on the transformation of matter and the motions inherent in matter, investigators were led to the acceptance of a separate so-called "vital force;" it was indeed the easiest way to dispose of the phenomena of life. However, strictly speaking, it was no explanation whatsoever, but merely the invention of a word, referring all unexplicable phenomena and results to the mysterious entity supposed to be represented by that word.

The same irrational method is still adhered to by many physicists who have not yet risen to the full comprehension of the doctrine of the conservation of forces and the mechanical equivalent of heat; they speak still of a caloric fluid, an electric fluid, a luminiferous ether, an electric ether, a magnetic fluid and even a psychic fluid for the phenomena produced by the supposed psychic force. All such hypotheses will remain acceptable as long as minds are educated in our schools in such a way as to be satisfied with taking mere words for things and empty phrases for rational explanations.

PROGRESS OF THE EIGHT HOUR STRIKE.

It seems to be an impossibility for the workmen enlisted in the eight hour movement to comprehend that, although they have a perfect right to demand as much wages as they please, to talk as loud and as long as they like, or to strike as often as suits them, they have no authority to interfere with the rights of others, or to destroy the property of employers who refuse to accede to their demands. The record of events of the past week in this city shows a series of attempts on the part of the strikers to compel, by sheer brute force, all other workmen to yield to their views. As a natural consequence, they have come into collisions with the officers of the law, which have invariably resulted in their discomfiture and defeat. Apart from the loss of public moral support caused by such reckless violation of the law, the eight hour movement has been still further weakened by being abandonen by large numbers of its adherents, while among those who still hold out, in spite of their continual reinforcement by bodies of men who have become dissatisfied with terms to which they at first agreed, there seems to be a large decrease in confidence in the ultimate success of the strike.

The first overt act of riot was committed by a gang of strikers at Steinway's pianoforte factory, on the morning of the 15th ultimo. There being some five hundred and forty men still at work in the building, the strikers gathered in a mob and started, according to their own representation, merely to present to the operatives a copy of resolutions which had been recently passed by the eight hour league. This, however, is hardly credible, because they undertook to charge upon and force an entrance into the building, and when ordered by the police to disperse and clear the street, they refused to obey the command. A charge by the police followed, which resulted in the scattering of the crowd and the severe clubbing of about a dozen of the strikers—a proceeding which occasioned the greatest excitement among the supporters of the movement generally, and brought down on the police condemnation, from several of the daily journals, for resorting to unnecessary violence. We cannot for our own part see what excuse our contemporaries can find for such acts as attempts to break open factories or raise riots, nor can we perceive with what shadow of justice the police have been made the objects of animadversion because they did their duty in protecting private property and dispersing a lawless mob.

The heaviest blow which the movement has received has been the resumption of work under the old system by all the coach makers, including the painters, body makers, and trimmers, in the carriage trade. The collapse of this branch of the strike is due to the action of the employees of Messrs. Brewster & Co., numbering some three hundred men. We commented in our last issue on the folly of the course taken by these workmen in breaking up the industrial association by which they were governed. It seems, however, that at present, after becoming convinced that they had caused a loss to the firm of over twenty thousand dollars, besides forfeiting all the dividends due them, they have concluded that they were in the wrong, and, after considerable discussion have abandoned the strike and returned to work at the old hours and old prices.

Among the iron and metal workers, there are still 1,150 men on strike; 2,500 are at work on the eight hour system, and are taxed two dollars per week for the support of those who are still unemployed. It is reported that this branch of trade is supported by English associations. At the Metropolitan Gas works, where a little more than a week ago a reduction to eight hours labor was granted to the employees, the strike has again broken out. On account of the reduction of the number of hours, three gangs of workers were organized instead of two as heretofore. This necessitated the employment of new men, who were immediately made the objects of persecution by the old hands. Some of the latter, having been discovered in attempts to get the new comers discharged for bad work, were themselves dismissed, whereupon the entire gang struck, refusing to work until the offenders were reinstated. The company has declined the demand, and has returned to the twelve hour system with twenty five per cent advanced wages, carrying on their works with a new set of men.

At Charles Durant's sugar refinery in Brooklyn, another collision occurred between the police and some four hundred strikers, who were trying to force an entrance into the buildings. The latter were very roughly handled and forced to disperse. There seems more justice in the demands of this body of men than in those of any other trade. They receive only from $1.60 to $2.50 per day for working fourteen hours in rooms heated to 80° or 90° Fahrenheit. What they now ask is a uniform rate of $2.50 for ten hours' work, and twenty-five cents an hour for extra labor. The refiners on their side state that many of these men were getting much greater wages than they now demand, and that, if the pay of all be equalized, the absurdity will be presented of workmen striking for a lower instead of a higher rate of remuneration. Thirteen refineries are on strike, but as the employees appear to be slowly returning to work under the old system, a speedy resumption of business is anticipated. On the New York Central and Hudson River Railroad, it is reported that the workmen are joining the movement along the entire route. In the piano factories, two thirds of the men have resumed work under the old system; no advance in wages has been accorded except at Steinways', where ten per cent has been allowed.

At a meeting of employers recently held, in which were represented many of the largest establishments in the city, concerted action was agreed upon and the views of several leading manufacturers fully expressed. Speeches were made by Mr. Britton, of Brewster & Co., Mr. A. S. Cameron, Mr. John Roach and others, detailing their past experience of the strike. The following resolutions were adopted as the ultimatum of the employers of the city:

Whereas, We, the undersigned employers, representing the general manufacturing interests of the city of New York, have been called upon by our employees to reduce the hours of labor from ten hours to eight; and

Whereas, We have given the subject our most careful and serious consideration, and we find that labor has cost more in New York than at any other point—a fact which has driven a large number of manufacturing concerns from our city—and as a reduction of the hours of labor would increase the cost of living, it would be necessary, in order that mechanics might live as comfortably as heretofore, to pay them more for eight hours' labor than we have been accustomed to pay them for ten—increased cost of production being a direct tax on the producer—and having been sorely pressed heretofore by close competition outside of our city, we find that we are entirely unable to meet this demand; and we have, therefore,

Resolved, That we will hereafter pay our workmen by the hour, and we will only employ such as are willing to work ten hours per day. and we will close our establishments, if necessary, and keep them closed, until we can employ workmen on this basis. And as the "trades' unions," "societies," and "leagues," so called, have, by their unreasonable and arbitrary demands, done much to destroy the relations between employer and employed by forming combinations to secure the same rate of compensation for inferior as for superior workmen, by dictating to employers the condition under which they will be permitted to conduct their business, in some cases imposing heavy fines on such employers as infringe the regulations laid down by their workmen; and, considering such tyranny incompatible with the best interests of both, we have therefore further

Resolved, That we will not hereafter retain in our employment any workman guilty of any act looking to the arbitrary

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establishment of relations between the employer and employed.

And, in conclusion, we earnestly call upon our mechanics individually to exercise their own good sense in the present emergency, and to avoid evil counsels.

When trades' unions, as in the case of the iron molders, go so far as to attempt to regulate the number of apprentices a shop shall contain, to prevent whom they please from earning his daily bread, to fine men for trying to get work save through their agents, and to deliberately resolve that owners of works shall not "presume" to control their own business, we think it high time for employers to join in combination and refuse all society men admittance to their shops. Such associations are productive of no benefit to the working man, and if he individually cannot resist their power, it is the duty of the employer to afford him every protection against them.

POSTAL REFORM.

As a means of disseminating useful information through the medium of cheap literature to the masses, as an aid in promoting social intercourse, as a facilitation of business enterprise, as a help to self education through increased letter writing, and as affording fuller and freer interchange of ideas, our postal system is of the utmost national importance; and the acquisition of such reforms as will insure its greatest efficiency at the lowest possible cost is a subject interesting to every individual able to read and write. The success attending the use of postal cards in England affords evidence of the favor with which any step in the direction of cheap postage is popularly regarded; and the large increase of matter passing through the mails of that country since the introduction of the system proves that the people gladly welcome any project tending to decrease the expense of intercommunication.

There is no question but that at the present time a necessity exists for still further modification of our postal laws, in accordance with the growth of the nation in territory, population and commercial prosperity. The day when every letter was accompanied on its journey by a regular bill of lading which had to be checked at each post office through which it travelled is past: but the labor of transportation, assortment, and delivery, although materially simplified, is not reduced to the lowest possible expenditure, nor has the service in general that completeness and uniformity of organization adequate to the proper fulfilment of the work it is called upon to perform.

Transportation, cost of stamps, salaries of employees and rent of buildings are the elements which make up the sum total of our postal expenses. So far as the transportation of letters themselves is concerned, their actual weight is of but little moment. It is rarely that an ordinary communication weighs half an ounce, the legal rate, so that double or even quadruple the number of letters might be carried without producing any material difference in the expense arising from the mere heaviness of the mails. But there is other and far bulkier material than prepaid letters to be forwarded. The free exchange of periodicals and the abuse of the franking privilege necessitates the transmission of a vast quantity of matter which, from its nature, constitutes the bulk of the mails, and on which no tax is levied. As a result, letter postage is placed at a figure sufficiently great to meet the deficit thus incurred, so that, virtually, the people at large have to pay for the tuns of Congressional documents and transient publications which are yearly sent on private business between private parties. Taking all this dead-head matter into consideration, in connection with the cost of its transportation over the great distances separating points on our territory, it is plainly evident that, so long as the present state of affairs exists, postage as cheap as that of Great Britain will be an impossibility; nor can any reduction of the sum at present paid for letter postage be effected until a uniform rate be established, taxable on every particle of matter forwarded and based upon weight, or on weight and distance sent, combined.

In the city of New York, it costs as much to send a letter across the river to Brooklyn as to San Francisco, and yet it can hardly be urged that the expense is as great to transmit that letter to one city as to the other.

For other matter than letters, an equalization of charges is even a greater necessity. We see no reason why the publisher of a weekly journal should, in case he desires to forward fifty-two copies of his journal at one time to a non-subscriber, be compelled to pay one dollar and four cents postage; while if, to a subscriber, one number of the paper be sent weekly for fifty-two weeks, the charge for the entire year is but twenty cents. In both instances the number of copies sent is precisely the same; why then should wholesale rates be paid in one case and not in the other? What is needed is a fixed uniform rate of newspaper postage, sufficiently low to make it no great burden if imposed on exchanges or on publishers who forward large quantities of matter, and which, if collected on every periodical or package passing through the mails, would yield an income sufficient to counterbalance the reduction of letter postage to one cent per half ounce. The franking privilege is simply a crying evil, and we trust that the day of its total abolition is not far distant.

The new postal rates, which have lately come into effect, are more valuable on account of their opening the way toward future and greater reductions than for the saving of postage in which they may at present result. Postal cards, for correspondence or for printed circulars, similar to those already in use in England and other European countries, have been authorized. The card will bear a one cent stamp and will be imprinted with lines for the address. The back will be ruled for the letter. The price for both card and stamp will be one cent. As the plates for printing are not yet prepared, it will probably be three or four weeks before the cards will be ready for issue. The charges on circulars are reduced from two cents to one cent for every two ounces or fraction thereof. Transient newspapers, pamphlets, magazines, etc., are also to pay one cent for every two ounces or fraction, instead of two cents for every four ounces or less as under the old law. On books, the postage is two cents for every two ounces or fraction, the weight being limited to four pounds; and on samples of merchandise, etc., the rates are the same as for books, with the limitation of weight to twelve ounces.

The cost of labor in our post office system can only be lessened by a thorough remodelling of the various departments, and by doing away with much unnecessary and useless work which tends but to make their interior machinery complicated and unwieldly. There is very little value in the stamp of date and locality usually imprinted on the exterior of the envelope. It is almost invariably illegible and might easily be dispensed with on ordinary letters; though if its use were required by the sender, means should be provided and a charge made for affixing it carefully and properly. A contemporary suggests that stamped envelopes should be more generally employed for drop letters; and by this mode, the time and labor of obliterating the postage stamp would be saved, as the mere writing of the address on the exterior would be a sufficient cancellation.

A thousand million letters yearly pass through our mails, and yet the statistics of the Post Office Department show that the country suffers a deficiency, and that, instead of being a means of revenue, our postal arrangements are a source of expense. This, by proper organization, judicious retrenchment, and a uniform low rate of postage honestly enforced, can be eventually remedied; and although the various innovations and improvements will doubtless in the beginning prove expensive, still in the end we believe they will become self supporting by the postal increase they will produce.

THE TARIFF AND TAX REDUCTIONS.

The bill providing for a reduction of fifty-three million dollars yearly of government revenue from taxes and tariffs has at length passed both houses of Congress. The substance of the act is as follows: The present duties on cotton goods, wools, metals, glassware, paper (except sized printing paper, which is made twenty five per cent *ad valorem*), leather and books are reduced ten per cent. The addition of ten per cent *ad valorem* on indirect shipments of East India products is revived. Hides are placed on the free list, and important reductions are made in the duties on salt and coal. Inventors will be interested in Section 6, which provides that, for a term of two years from and after the passage of the act and no longer, machinery and apparatus designed for or adapted to steam towage on canals and not now manufactured in the United States may be imported by any State or by any person authorized by the Legislature of any State, free of duty, subject to such regulations as may be prescribed by the Secretary of the Treasury. The free importation of steam plows is is also permitted for the same period of time and under the same restrictions. Shipbuilding material for use in vessels engaged in foreign trade is exempt from duty, but vessels receiving the benefit of this provision cannot engage in the coastwise trade for more than two months in a year without the payment of the usual tariff. Salt to be used for curing fish is also made free. Extensive alterations are made in the mode of collecting revenue from distilleries, and voluminous instructions are given for the conduct of their business. The tax on distilled liquors is consolidated, but no actual reduction is made. On tobacco, the tax is equalized at twenty cents per pound, instead of sixteen and thirty two cents a formerly. The standard of vinegar, according to which import duties are to be collected, is fixed at a strength which requires thirty-five grains of bicarbonate of potash to neutralize one ounce troy of vinegar. The tax on gas made from coal, wholly or in part, or from any other material, is repealed.

The stamps on legal papers, stock sales, foreign bills of exchange, merchant notes, etc., are abolished after October 1st. The stamp duty on friction matches is retained, and also the two cent stamp on checks, drafts and orders for money. Informers' moieties are rescinded, and an appropriation of one hundred thousand dollars made to cover the expenses of bringing to punishment persons violating the revenue laws. The internal taxes against shipbuilders for sales of vessels are remitted.

Before the 1st of January, 1873, the President is directed to reduce the revenue districts to eighty in number. One collector and one assessor in each district are all the officials hereafter to be appointed by the President, and their appointees are to be reduced to the lowest possible number. This provision necessitates the removal of about two hundred and eighty office holders, and is the most important, in an economical point of view, in the entire act.

With the exception of tea and coffee, which were made free from July 1st, under a previous act, and the revised whiskey and tobacco taxes, which take effect from the same date, the alterations and reductions provided for by the bill go into operation on the 1st of August next.

RAPID TRANSIT IN NEW YORK.

At the recent session of the New York State Legislature several projects for securing rapid transit in this city were passed, but only two of them have been approved by the Governor. Of these, the most prominent is the charter granted to the millionaire Vanderbilt, giving him authority to construct an underground steam railway, in connection with the existing Harlem railway, commencing on Fourth avenue at 59th street, and extending southwardly, through Fourth avenue, the Bowery, Bayard, Park, and Center streets into the City Hall Park, at a point near Broadway between the City Hall and the Post Office. The expenses of construction will be very heavy, but it is stated that it will be soon commenced and rapidly built. We hope that this statement will prove to be correct, for the citizens of New York are subjected to great inconvenience for lack of the means of rapid transit, while the owners of property are compelled to lose the benefits of the increased valuations which would be theirs were the city limits rendered more accessible and more fully inhabited. The privileges granted to Vanderbilt are in some respects remarkable. It would naturally be supposed that both the Legislature and the Governor would take care, as far as possible, in the wording of the grant, to protect the inhabitants of the city from all unnecessary nuisances, either in the construction or the operation of the road. As the latter is to be laid underground, beneath some of our best streets, and is to be operated by steam locomotives, it might have been expected that the company would be compelled to provide for the necessary ventilation, by side shafts and chimneys built on their own property so as not to incumber or impair the public streets. But no such provision was exacted. On the contrary, the bill gives the company permission to make openings for ventilation in the middle of the streets, the holes to be six feet in diameter, twenty feet apart, each surrounded by an iron railing. The two splendid and important thoroughfares under which the road runs are therefore to be occupied and disfigured by the railway corporation, while the air of both avenues is to be contaminated by the foul gases from the locomotives.

The project for the Broadway Underground Railway, known as the Beach Pneumatic Transit plan, which is admitted to have the best route and to be the most carefully prepared and most popular of any of the railway schemes ever presented to our citizens, passed both branches of the Legislature by large majorities, but failed to receive the Governor's approval. One of his principal adverse reasons was that a city engineer had officially reported to him as his opinion that the sewerage of Broadway would be interfered with, and that the work was impracticable; but many of our eminent engineers and architects had testified to him that the work was entirely practicable. The action of the Governor shows how deficient in practical information some of our prominent public men are, and how little they appreciate the public wants. Broadway is the backbone of Manhattan island. From it, the land slopes gently off to the rivers on each side. It is the grand thoroughfare of the city, the special objective or central line of business and travel, and the construction of a first class fast railway under its surface is urgently demanded for the public convenience. It is generally conceded that the existence of such a railway under Broadway would greatly increase the traffic of the street and augment property values. The Beach Transit bill provided for the construction of ventilated tunnels, built on the most approved plans. The bill lacked one vote of a passage over the Governor's veto in the Senate, and will probably become a law at the next session. The company has spent a large amount of money in the perfecting of their plans and in the demonstration of their practicability. They have put a short section of their underground railway in operation under Broadway, between Warren and Murray streets, heretofore fully described by us. The route is from the extreme southern end of the city at the Battery, up Broadway to and under the Harlem river, with sundry branches.

In this connection, it may be stated that the expenses of constructing an underground railway through the heart of a city are necessarily very heavy, and in order to secure the success of such an enterprise the route adopted should be the one best calculated to accommodate the public and yield the largest local traffic. In New York, the Broadway route stands pre-eminent in these respects. Mr. John Fowler, Engineer-in-Chief of the London underground railways, testifying recently on the general subject of underground city roads before a Parliamentary committee, said that "the stations must be on the thoroughfare, and visible to the public." In other words, a city road must be located with special reference to the convenience of the people, or it will not be properly patronized.

The other rapid transit bill approved by the Governor is known as the Swain three-tier road. It provides for the construction of an underground railway, a surface railway, and an elevated railway, all on the same line. The route authorized is upon the west side of the city, commencing at or near the Bowling Green and running northwardly to and over Harlem river. The company is compelled for the most part of its route to buy its way through private property, and this cost, added to the expense of building the works, will, it is believed by many, be so great as to hinder the construction. But we hope not. In so large and prosperous a city as New York, there is room and need for several lines of rapid transit railways, and all of them would doubtless be well supported.

A MACHINE THAT TALKS.

There has lately been on exhibition, in one of the theatres in this city, an ingenious machine which counterfeits, with remarkable fidelity, the sounds of the human voice. It was invented some thirty years ago by Professor Faber, of Vienna, and was, as we learn, exhibited shortly afterwards in this country. Recently, however, the apparatus has been so much altered and improved by a son of the inventor that at present it bears but little resemblance to the original, and may, for all practical purposes, be considered an entirely different machine.

Although the mechanism is constructed to imitate as closely as possible the simple working of the human vocal apparatus, yet it is so intricate in detail that an attempt to describe accurately the functions of its many tubes, levers,

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wires, and springs would only serve to confuse and mislead the reader. We therefore content ourselves with a general outline of its working parts. The machine consists of the mouth and larynx, the bellows supplying the current of air to the latter, the treadle which works the bellows, and final, ly, the various levers which move the mechanism producing the different sounds. The larynx is made of india rubber, and the part corresponding to the glottis in the human throat is constructed of strips of ivory. The lower jaw is movable, and is made of gutta percha. The upper jaw is stationary, and is formed of wood. The upper lip is of leather, and the roof of the mouth, gutta percha; the soft palate is omitted, and the tongue, which is of rubber, is made flexible, and is so arranged as to press against the back of the throat or against the hard palate. A thin strip of metal falling from above the upper lip is made to close the mouth and so supply the place of the teeth in producing the dental sounds.

A great deal of ingenuity is manifested in the manner of imitating the varied intonations of the voice. By combining the fourteen sounds (*a, e, i, o,* and *u,* vowel, and *g, b, d, f, j, sh, w, l,* and *r,* consonants), the words of any language may be pronounced. The principal deficiency in articulation, however, seems to rest in enunciating the sound of *d,* which is made to resemble that of *th* and sometimes *l.* The nasal accents of *m* and *n* are made by closing the lips as for *b* or *p,* and causing the air to pass through a small tube which leads from the larynx beyond the vocal cords. *R* is pronounced by the dropping, into the blast of air passing to the glottis, of a small revolving wheel which produces the rolling sound.

The bellows, worked by the treadle pressed by the foot of the operator, take the place of the lungs and force the air either in a strong or mild current. The pitch of the voice can be made high or low as may be desired. The articulation is quite clear, but the sentences are all uttered in a dismal monotone, which to a nervous individual would doubtless prove peculiarly depressing. There is not the least rising or falling inflection to the voice, except when the operator permits the last word of a sentence to die away in a doleful wail.

When exhibited in public, the machine generally begins its performances by the repeating of such words as "Alexandria, Maria, Lucia," and the like, which contain many vowel sounds. Then sentences are attempted, the last and parting remarks of the machine being pronounced somewhat as follows: "*Gootah nai-te laythees anner-r-r-r jantlermn. Ai ope eeu air-r-r sah tees faithe oueethe ume-e-e-e.* (Good night, ladies and gentlemen. I hope you are satisfied with me.) If the reader will enunciate the above as written, remembering to keep his voice to a high tenor note (the A above the middle C, for instance), and to let the last sound *e* die out in a squeak, he will obtain an excellent idea of the conversational powers of the machine.

Of the three languages spoken, German is pronounced much the best, the gutturals and aspirates of that language being delivered with great clearness. For conversing in French, a mask of rubber is fitted over the mouth of the apparatus and the sound forced through passages in the nose, thus producing the nasal accents peculiar to that language.

A vast amount of time and labor has doubtless been spent in perfecting this intricate piece of mechanism, which, now that it is completed, is of little practical value. We can think of no particular use to which it can be applied, unless perhaps some ingenious Yankee can improve on it by adding a barrel and clockwork like a music box, which, when wound up, would act on the levers, causing the machine to deliver a fixed speech. This would be useful in numberless ways, in stumping the country, for instance, during the coming Presidential campaign, or for repeating sermons of popular clergymen while their reverend authors are enjoying their six months' vacation in Europe. Manufacturers and inventors might avail themselves of its most persuasive tones to describe the varied excellencies of their productions or patents to would be customers; or perhaps some good Samaritan will devise a small portable form of the apparatus which can be wound up to utter such words as "We don't want any matches—or suspenders—or our boots shined," etc., and which can be set automatically in motion and so prevent the infesting of our sanctums by those ubiquitous scourges, the peddlers and bootblacks.

SCIENTIFIC AND PRACTICAL INFORMATION.

EMBALMING BODIES BY INJECTION.

Les Mondes reports that the system of M. Gannal, of embalming bodies by injection, which was effected by opening the jugular vein or the carotid artery, is probably to be superseded by M. Audigier's plan, in which the preserving fluid is introduced through the mouth and the larynx. About six ounces of the fluid is sufficient for the purpose, and the body should be covered with some vegetable powder soaked in the same liquid. The body is by these means completely preserved, and is entirely "mummified;" it acquires a durability equal to that of wood or stone, and the facial color remains as it was at the moment of decease. The most eminent physicians, surgeons, and anatomists in France have testified to the efficacy of the system, which has, in addition to the advantages already mentioned, that of perfect innocuousness and complete disinfection. The liquid, we presume, is carbolic acid. The mode of application is the same as that devised by Professor Charles A. Seeley, of this city, and by him very successfully applied to the preservation of bodies at the hospitals here.

KEEPING NUTS.

Mr. J. B. Winder, of Birmingham, England, writes to say, in reply to H. J. S.'s letter to the Oneida *Circular*, published on page 304 of Vol. XXVI., that he has, for ten years, practiced a method, of keeping nuts in store, more efficient than either the earth or dead leaves treatment. He selects walnuts of good flavor, not gathered till ripe, that the shells may be strong and well filled; he prefers Dutch or Belgian walnuts to English, as the shells are better matured. "They should be placed in large jars, holding four, six, or eight gallons each the tops of which should be covered with plates or saucers. They are in proper condition when they are just damp enough to peel the skin off easily. If they get too dry, sprinkle them with water; if too wet, place them on trays to dry. If wanted to keep till June or July, keep them just dry enough not to peel easily, and damp a few up, when wanted for use, in a smaller jar. I have now (June 1st) good walnuts. Filberts and other nuts can be kept two years on this plan, walnuts being the most difficult. If very damp, they will grow during the last weeks in March." Mr. Winder concludes: "I have great satisfaction in offering you the information, having derived much pleasure from reading the SCIENTIFIC AMERICAN."

EARTH POULTICES.

The value of earth as a disinfectant and deodorizer is well known; and the treatment of ulcerated sores and gangrenous wounds with it is becoming very general. A new application has lately been described by Dr. E. S. Bunker, who states that he has recently used clay as a dressing for the face in two cases of confluent small pox, dusting it, in fine powder, over the faces of the patients as soon as the pustules become fairly developed. This formed a clean, dry, wholesome scab, absorbing the infectious material, and scaled off during convalescence, leaving the underlying skin in its natural and normal state. The painful itching, which is one of the worst characteristics of the disease, was entirely abated. The earth used was fine pipe clay.

SUPERIORITY OF THE RIGHT OVER THE LEFT HAND.

Dr. William Ogle recently read a paper before the Chirugical Society of London, in which he stated his belief that the superiority of the right hand, in works requiring strength and skill, is not due only to custom and usage. His reasons for this view are that the superior power of the right side is not confined to the arm but extends to the leg, and that it commences in the arm before use or education begins, and continues in spite of all efforts to resist or divert it. This superiority has a resemblance to some malformations, inasmuch as it is hereditary and is met with more frequently in the male sex, not only in men, but in apes and parrots. The author further asserted that the left side of a right handed man is greater than the right, and *vice versâ;* and he cited seven cases of aphasia, among left handed people, accompanied by hemiplexy of the left side. He concluded by asking: What is the cause of this greater development of the left side? And he suggests that it is originated by the greater quantity of blood which it receives.

A VALUABLE PATENT.

We have recently received a pocket box, for friction matches, made of iron; it is in size $1\frac{1}{2} \times 1 \times \frac{3}{8}$ of an inch, and has a spring to keep the lid either open or shut, as may be desired. It is the invention of M. Trottier, of Paris; and he has recently sold his patent for £1,500 ($7,500 gold) to Messrs. Bryant and May, London. This is one of those small inventions, which, although apparently unimportant, is what everybody wants, and the patent is thereof of much value.

DRUNKENNESS IN RUSSIA.

Every individual found, in the streets of the cities and towns of Russia, in a state of intoxication is compelled to work at sweeping the streets during the whole of the following day. The rigor and impartiality, as to nation, sex, or condition, with which this rule is carried out is worthy of imitation by many more civilized nations.

THE ROMANCE OF PHOTOGRAPHY.—We often take a picture of a young man, then of a young lady, sometimes a group of two; then the bride in her wedding dress with its long train, then in due time the baby, first in its long clothes, then in its short ones, then in his first pants, then as he goes away from "ma" to boarding school, when he comes home in his school uniform, when he cultivates his first moustache and whiskers, and again his girl, and again on through the same routine. So you see the romance.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20 1869. 64 Nassau st., New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Patent for Sale—Moulding, Burnishing, and Varnishing Machine, the whole or single States, by J. Gschwind, Hudson Avenue, Union Hill, N. J. Or, a Partner wanted.

For the simplest, cheapest, and best Rotary Pump in use for thick or thin liquids, send for circulars to Hersey Brothers, So. Boston, Mass.

Wanted, Patent Glove Clasps made. J. L. Weir, Dresden, Ont.

Wanted—Iron Planer, of 5 to 6 ft. square by 12 to 16 ft. long, capacity. Must be new, or as good. Will exchange for some choice selected lands situated within 5 to 10 miles of Rail Roads in Northern Iowa. John Cooper & Co., Mount Vernon, Ohio.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

The best Bolt Forging Machines are those that work vertical, and forge Bolts any length horizontally. For such, address John R. Abbe, 39 Charles Street, Providence, R. I.

Glass—True Cylinders. T. Degnan, 115 Milk St., Boston, Mass

Imperfect machines, Ideas, if practicable, which can be put into shape by careful and skillful workmanship, long and severely tested experience as inventors and a thorough knowledge of mechanics should be submitted to Koch & Brass, 59 Scholes St., Brooklyn, E. D.

To Capitalists—Two valuable Patent Rights for Sale or exchange for other property. For particulars, address John J. Baringer, Germantown, Columbia Co., N. Y.

Upright Drills—The best in the world. Built by Hawes Machine Co., Fall River, Mass. Send for Circular.

Wanted—One Pattern Maker. Apply to A. Leitelt & Bro., Grand Rapids, Mich.

For the most beautiful Site, Building, and Water Power for manufacturing purposes, address Harris Brothers, Newport, N. Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Three fourths saving of fuel, by the Ellis Vapor Engine (Bisulphide of Carbon) in running the Haskins Machine Co's Works, Fitchburg, Mass. To whom apply.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Write for Chemicals, Crude Materials, and Drugs for Manufacturers' use, to L. & J. W. Feuchtwanger, 55 Cedar Street, New York.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water street, New York.

The Waters Perfect Steam Engine Governor is manufactured by the Haskins Machine Co., Fitchburgh, Mass.

Wanted—A first class Sewing Machine Repairer. T. Shanks, Baltimore, Md.

Galvanized Slating Nails, Stove Reservoirs, and Hollow Ware. Address Cleveland Galvanizing Works, Cleveland, Ohio.

Portable Baths. Address Portable Bath Co., Sag Harbor, N. Y.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ¼ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 30 Cortlandt st., New York.

For hand fire engines, address Rumsey & Co., Seneca Falls, N. Y.

If you want a perfect motor, buy the Baxter Steam Engine.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Tri-nitroglycerin, insulated wire, exploders, with pamphlet, as used in the Hoosac Tunnel, send to Geo. M. Mowbray, North Adams, Mass.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N. Y.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

The Patna Brand of Page's Patent Lacing is the best. Orders promptly filled by the Page Belting Co., No. 1 Federal St., Boston.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

The Baxter Steam Engine is safe, and pays no extra Insurance.

Betterthan the Best—Davis' Patent Recording Steam Gauge. Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

"What I know about Machinery," especially Engines, Pumps, and Machinists' Tools, which I sell at 93 Liberty Street, New York. S. N. Hartwell, late agent for L. W. Pond.

The most economical Engine, from 2 to 10 H.P., is the Baxter.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca Falls, N. Y.

Facts for the Ladies.—Mrs. Coyne, Richmond, N. Y., has used her Wheeler & Wilson Lock-Stitch Sewing Machine since September, 1857, for the work of a large family; learned to use it without any instruction, and in three days has made 3 shirts, hemmed 3 table cloths and 6 towels. It is the only machine that does work nicely enough for her; her little daughter learned to use it in one afternoon, and can run it as fast and do as good work as any one. See the new Improvements and Woods' Lock-Stitch Ripper.

"Whitcomb's Remedy cured me of Asthma."—CALVIN DIBBLE, Pataskala, Ohio.

Save Money.—It is well worth saving, and you can save it in buying a Sewing Machine, and get one of the best and most perfect machines in existence. The New Wilson Under-Feed Sewing Machine has reached a point of excellence and perfectness equalled by no machine in use, and the constantly and rapidly increasing demand, which is almost beyond their manufacturing capacity to supply, is convincing evidence that the merits and cheapness of this machine are being appreciated by the public. Salesroom, 707 Broadway, New York; also for sale in all other cities in the U. S.

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GRANT AND WILSON.

We have engaged the services of Mr. A. H. Ritchie. of world-wide reputation as an artist, to produce for THE INDEPENDENT, as speedily as possible, and for our exclusive use, a superb STEEL ENGRAVING of Hon. Henry Wilson, a companion picture to that of President Grant, already known to tens of thousands of our subscribers in every section of the country. This new and magnificent engraving—size 19 by 24 inches—will be ready for delivery during the coming month. On and after this date, therefore, we will *present* these two fine steel engravings of Grant and Wilson for every *new* yearly subscriber sent us, with the money—$2.50. They will be delivered at our office, or sent by mail, postage paid, at the option of the subscriber. These engravings are printed on separate sheets of fine pasteboard, suitable for framing. They will be carefully rolled on wood, warranted to arrive in good order and to give entire satisfaction, or they may be returned and the money positively refunded.

Let every true hearted Republican, every friend of Grant and Wilson, and every political organization in the country, promptly send to us for these beautiful and desirable pictures, produced by one of the most celebrated artists in the world—the author of the "Emancipation Proclamation" and "Authors of the United States," etc. Engravings of this class sell at the print stores at from $2 to $5 *each*. Both will be *given away*, together with THE INDEPENDENT for one year, to any person who will, as before stated, send us the name of one new subscriber and $2.50. We shall register the names and deliver the engravings in the order in which they are received. Books are now open. *Any person may act as agent.* Address HENRY C. BOWEN, Box 2787, New York City.—*Advertisement.*

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—MILK SOURED BY A THUNDERSTORM.—Can any one give me the scientific reason why milk turns sour during a thunderstorm?—H. C. R.

2.—PHOTOGRAPHS FINISHED IN OIL.—How shall I prepare the surface of a photograph on plain paper to prevent the sinking in of oil colors?—G. W. T.

3.—TORPEDOES.—How are the toy torpedoes, in balls of paper, made?—L. C. T.

4.—WELDING STEEL AND COPPER.—Is there any process by which steel and copper can be united, as steel and iron are united in cutting tools, etc.?—J. E. S.

5.—STANDARD MEASURES.—What is the exact length of an inch? Barley corns are not all one length.—P. E. McD.

6.—PICTURE CLEANING.—What kind of a wash or preparation should I apply to oil paintings for the purpose of cleansing or regenerating them?—C.

7.—COOLING WATER.—I wish to know of a simple method of cooling lake water (heated daily by the sun) without the use of ice, for drinking, also the best method of purifying it.—J. A. C.

8.—ADULTERATION OF TURPENTINE.—I sold a customer some spirits of turpentine to paint with. He insists that benzine is mixed with it. I never heard of such an adulteration. How can it be detected by any means other than trying the specific gravity?—G. B.

9.—TAR FLOORS.—I wish to know how to remove the unpleasant smell arising rom a basement floor that has been laid (for over two years) with a composition of coal tar and sand.—H. P. T.

10.—BACK GEARS.—I am making a lathe, with a 2 feet bed, 6 inch swing, and mandrel five eighths inch in diameter. I wish to know the proportions of back gear, and how to make it for a lathe of the size mentioned. The cone pulley on the mandrel is 1¾ and 3 inches. The band wheel is to be 2 feet in diameter to the 1¾ inches. How large should it be to the 3 inches to keep the belt tight?—F. H. J.

11.—CASE HARDENING IRON.—In case hardening iron with bone and leather shavings, should the shavings be used more than once? Should acid (vinegar) water, salt water, or clean cold water be used to cool the articles in?—R. K.

12.—BLASTING UNDER WATER.—How can I protect powder from the wet in blasting under water? I wish to make a few blasts where the water is from 10 to 18 inches deep.—A. A. P.

13.—LEAD IN WATER.—There has been a great deal said in your paper about water being poisoned by passing through lead pipe. Cannot it be obviated by substituting rubber tubing in many instances? Will some one who knows, give us his ideas on the subject, and tell us if the use of rubber would be practicable for wells and cisterns?—J. M.

14.—PHOSPHIDE OF CALCIUM.—Can some of your readers inform me of a cheaper and more convenient way of preparing phosphide o calcium than that described by J. S. on page 386 of Vol. XXVI?—X. R. C.

15.—CASE HARDENING MALLEABLE IRON CASTINGS.—Can some one tell me the best method of case hardening, by the quantity, malleable iron castings about one inch square? I want to harden one sixteenth of an inch deep if possible. How long ought they to stay in the fire?—W. A. S.

16.—UNITED STATES COINAGE.—When did the issue of the series of large United States coppers and of the United States half cents begin and cease, and what were the years in which they were not coined, if any? When did the circulation of the small United States cent with an eagle on one side begin, and for how many years was it coined?—F. R. E.

17.—CANARIES AND VERMIN.—I wish to know how to get rid of lice or vermin in canaries, without injury to the birds.—D. F. W.

18.—MIRROR.—Is there any solution or composition, which can be put on tin or any similar substance, that will not blister or crack if brought within two inches of the blaze of a lamp, and at the same time will reflect the light?—G. L.

19.—TAKING IMPRESSIONS BY RUBBING.—I want to know how to make impression paper. I have seen some by which one may take the picture of a leaf, by just rubbing the leaf on it and then rubbing the impression on paper or stone.—S.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

J. B., of N. C.—We publish three of your queries. The others are business enquiries. See notice at the head of this column.

PRESERVING NATURAL FLOWERS.—L. L., of Mass., is referred to pages 201 and 281 of volume XXVI. The last method is an excellent one.

REMOVING INK STAINS.—W. W. R., of N. Y., has omitted to send his recipe.

BURNING GLASS QUERIES.—E. E. S. will not gain any warmth by concentrating the sun's rays and then dispersing the heat through a current of air. The answer to the second query will depend on the size of the glass, the power of the sun, and the temperature of the atmosphere, none of which can be predicated.

ELECTRO-CHEMICAL TELEGRAPHY.—In your issue of May 25, on page 347, I find an interesting description of an electro-chemical copying press, the invention of Signor Zuccato, of Padua, Italy. Now I would like to ask you and the readers of your paper if the principle of that press cannot be used to transfer *fac simile* telegraphic messages? Let the varnished steel plate or writing tablet have inserted, vertically within it, from beneath, the ends of a multiplicity of wires separately insulated; the finer the writing, the finer and more numerous the wires should be; then let these wires, bound together as a cable or in the most suitable manner, be the conductors of the electricity to the sheets of copying paper specially prepared and damped with a solution of prussiate of potash. Would not any writing made by removing the varnish upon the tablet be represented in dotted lines upon the copying paper, at the distant station, immediately upon the occurrence of the electrolytic action communicated by the wires? The greatest objection to which this would be liable would probably be the cost of the connecting wires. Will not some inventor immortalize himself by removing this objection, and give to the world an instantaneous copying telegraph?—J. W. K., of Col. Ter. Answer: The plan of telegraphy above suggested is very old. It was, we believe, first put into operation by Alexander Bain.

L. S. H., of La.—The apparatus you designate "a pump or ram" is neither the one nor the other. According to your drawing and description, it is simply an apparatus for obstructing the flow of the water in its passage from the upper pipe to the lower one. It would not work automatically, for the reason that the escape of water from the bottom of a vessel does not produce a vacuum in the upper part.

TEACHING CHILDREN THE ALPHABET, ETC.—K. is informed that his idea is already in use, apparatus of the kind being for sale in every toy store.

WATERPROOFING MUSLIN.—W. H. J., query 11, page 385, Vol. XXVI., can obtain the material for a light waterproof tent of the American Waterproofing and Manufacturing Company, 176 Broadway, N. Y.

POWER FOR SEWING MACHINE.—W. W. S., of Miss., should know that the power requisite to drive a machine depends on the material being sewn; and the machines of different makers all vary as to the power required.

WATERPROOFING MUSLIN.—Query 11, page 385.—W. H. J. will have some difficulty in finding a means of thoroughly waterproofing his tent without adding much to its weight. Two recipes for processes applicable to muslin are given on page 105 of your volume XXVI., but none of the alum solutions will continue to resist long and heavy rains. The india rubber treatment described on page 266 of Vol. XXIV. is effective, but it will increase the weight of the cloth.—D. B., of N. Y.

PHOSPHORESCENT OIL.—Query 5, page 385.—H. W. B. should put a piece of phosphorus, the size of a pea, into a white glass vial, and pour in boiling olive oil till the vial is one third full, and cork up. When light is required, remove the cork for an instant. The air entering will cause the phosphorus to burn and a light will be obtained. As it fades, admit more air. This vial will last for six months without requiring any more phosphorus. I have seen this contrivance used, in depots of inflammable commodities and explosives, in Paris, and light sufficient for the use of keepers, warehousemen, and others is afforded by it.—D. B., of N. Y.

FUTURE HUNTING PROSPECTS.—At present it would be hard for O. K. to make his living out West by his rifle; if there are no laws against hunting, it is to be hoped that fifty years hence men will not be so cruel as to hunt and fish for amusement. The birds have been killed so that in many places the trees are being destroyed by worms. O. K. will be much more likely to know what the West is in half a century if he will exchange his rifle for a spade and pick.—L. S., of the West.

ACETIC ACID.—To F. O. R., query 8, page 370.—Put a quantity of acetate of soda or acetate of potash into a retort, and thereon pour its own weight of sulphuric acid diluted with twice its bulk of water. Connect retort with a receiver, which keep cold by water flowing over it, or in some other way. On heating the retort by a spirit lamp or gas flame, the acetic acid will soon begin to distil nearly quite pure.—E. H. H., of Mass.

OXYGEN IN SULPHURIC ACID.—To J. T., query 4, page 370.—One ounce or 480 grains of sulphur requires 1,800 cubic inches, or a little over one cubic foot of oxygen for its oxidation in forming sulphuric acid.—E. H. H., of Mass.

FORCE OF FALLING BODIES.—To J. E., query 12, June 8.—The hammer will strike with a momentum of 160,164·5472 pounds. The formula is

$$\text{the square root of } (4 \times 64{\cdot}33) = 16{\cdot}0312 \text{ velocity.}$$

Then

$$4{\cdot}426 \times 6000 \times 160312 = 160164{\cdot}5472.$$

Or, multiply the fall in feet by 64·33; the square root of the sum is the velocity; and multiply the weight in pounds by 4·426 and that by the velocity, and you have the momentum.—E. E. W., of W. Va.

FLAVORING EXTRACTS.—To E. R. T., query 9, page 370.—Powder the vanilla pods in a mortar with a quarter of a part of white lump sugar; then digest for a day or two with strong alcohol. Pour off the clear essence, and place the mud in a funnel whose stem is loosely closed with cotton wool; now pour over it alcohol until the whole flavoring principle is extracted. Mix the liquors together and you have the essence or extract of vanilla. Extract of lemon may be made by dissolving one part of essential oil of lemon in eight parts of alcohol; or by macerating the thin outside yellow rind of lemons in alcohol and then filtering.—E. H. H., of Mass.

TRANSFERRING MOTION.—I would say, in answer to W. F. W.'s query, June 8, page 385, Vol. XXVI., that a belt run with a half twist from a vertical to a horizontal shaft will answer the purpose; but he should have a flange on the lower end of the pulley on the vertical shaft to keep the belt from slipping off when loose. He may have some trouble at first in getting the pulley on the vertical shaft to the right hight; but if he fastens the pulley with a set screw, he can move it up or down as the running of the belt will indicate.—H. C. R., of O.

HYDROGEN LAMP.—C. C. W., of Ill., having read the many inquiries, on this subject, which we have published, forwards us the following excellent directions: Use chemically clean sulphuric acid and pure water—one pound of water to one fourth pound of acid. Put the water first in a clean bottle or jar, and drop the acid into it very slowly, shaking it at intervals to mix it. Let the mixture get cold before putting it in the jar, as the mixing of the two generates heat. Hang the cone of zinc, by the brass wire, inside of the inner glass vessel, which is the gas receiver; then pour the mixture in the jar. Never put in at one time any more than the occasion calls for. Unscrew the gas ejector on top, and by holding the lever down, permit all the air to escape out of the gas receiver; and as soon as the air escapes, the acid rises and fills the space, and at once commences to act upon the zinc; and as soon as the acid commences to act on the zinc, let the lever back and screw on the gas ejector. Always keep the sponge in the thimble protected while the air is being let out of the gas receiver. As the gas forms, it drives the acid down until, getting below the zinc, action ceases. As fast as the gas is let off, the mixture, which has been displaced, rises, and again coming in contact with the zinc, evolves a fresh supply of gas. Light the gas, first time, till the sponge in the thimble glows red hot. Afterwards it will ignite of itself. Never use sulphur or potass matches, but a slip of wood or paper. To get a light: Wait until the gas has lighted and then light the wood or paper. If the small hole where the gas issues becomes clogged clean it with a stiff bristle. After long use, if the acid does not attack the zinc, it needs a new supply of mixture. If the zinc has disappeared, renew that. The sponge in the thimble must be kept well protected all the time. The arch shape must be preserved, not broken or pressed down. When it wants renewal, remove the wire ring in front which keeps the sponge in its place. By actual test, one fourth pound of acid and one pound of water is mixture enough to make gas for 10,000 lights. One cone of zinc will last long enough for 20,000 lights; and the sponge in the thimble will last long enough (if not broken or pressed down) for 40,000 lights.

NEW PATENT LAW IN CANADA.

By the terms of the new patent law of Canada (taking effect September 1st, 1872) patents are to be granted in Canada to American citizens on the most favorable terms.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

In order to apply for a patent in Canada the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish pamphlets of instruction free.

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Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

MANUFACTURE OF SIRUPS.—Joshua C. Wood, Larissa, Texas.—This sirup is made from what is known as mustang or post oak grapes, sugar and water being added to the juice, and a certain mode of treatment pursued to insure the best results.

COTTON PRESS.—Wm. Bradley, West Point, Ga.—1st. The invention consists in combining with a screw press and follower, an arch thrown diagonally above the top of press, so as to allow the follower to be turned transversely thereacross and thus afford free entrance, on each side, to the ingress of cotton. 2nd. It consists in combining, with a laterally adjustable press follower, a gage guide which gages the distance to which the rotating follower may go, then arrests it, and finally guides it down into the press box.

RAILROAD GATE.—Hiram Conrad, New Columbia, Pa.—The invention consists in causing a projection from car or truck to strike a bar, turn a rockshaft and cause a weight to release a lever. The weight then falls and raises the gate by a projection on its rear. The wheel now forces down a pivoted bar and causes the weight to rise, while the next car that passes strikes the opposite bar, releases catch, and allows gate to fall by its own gravity. This device is applicable to a carriage or wagon road with but little change.

MEANS FOR FEEDING AND GIGGING BACK THE LOG CARRIAGE OF CIRCULAR SAW MILLS.—Allan Talbott, Richmond, Va.—The invention consists in improved means for feeding up and gigging back the log carriage of circular saw mills, whereby springs, catches and other contrivances are rendered unnecessary. This causes the machine to be much less liable to get out of order and enables the sawyer to control the carriage with equal facility from either end of the mill.

ELASTIC WASHER.—Caspar Dittman, Leacock, Pa.—The invention pertains to improvement in the construction of elastic washers of the class wherein the rubber for other packing is enclosed so as to be protected from injury by reason of the torsional action of the nut. The invention consists in the arrangement of a face plate or follower, having a radial tube to receive the screw bolt, in connection with a socket, for holding the elastic packing, whereby the packing is preserved from injury.

SOLDERING IRON.—Nathaniel G. Numsen, Baltimore, Md.—The invention consists in making a soldering iron in three parts which consist respectively of a tube, cap, and holder, arranged so as to form a new and improved article of manufacture.

AERATED WATER FOUNTAIN.—John C. Johnson, Louisville, Ky.—This invention consists of a crystal fountain for mixed water and air jets, in which a hollow water cylinder and air compression chamber for supplying the motive power, together with an air pump for compressing the air, are combined with the air mixing pipes and cocks and other apparatus of the fountain, and all inclosed in an ornamental case, which is adapted to be moved from place to place without incurring any disturbance or the necessity of changing the water connections. It also comprises a cluster of bent pipes of glass to be used in place of the jets commonly discharged into the air, through which the mingled water and air are forced alternately up and down, producing scenic effects of great beauty.

GRAIN DRYER.—Frederick H. C. Mey, Buffalo, N. Y.—This invention furnishes an improved apparatus for drying grain, which takes the wet grain, dries it by the application of hot air in such a way that it cannot burn or scorch it, and then cools it by the application of cold air, delivering the grain dry and cool, ready for storage or shipment. It consists in the combination of a peculiarly constructed drying chamber, through which the grain is made to pass while exposed to currents of heated air, a cooling chamber, in passing through which the grain is exposed to a blast of cold air, and a furnace. Fan blowers, elevators, and other adjuncts are also employed to effect the operation.

MOWING MACHINE.—John Clarridge, Mount Sterling, Ohio.—In this invention the driving shaft carries a wheel in the face of which is formed a zigzag groove. In this groove is placed a friction roller, which is attached to one end of a sliding bar in such a manner that the bar is made to slide backward and forward longitudinally as the wheel is turned. The motion thus set up in the sliding bar is conveyed by means of a pivoted lever to the pitman which drives the cutter bar. The sliding bar is made with a joint, so that it may be bent aside and thereby disengage the roller from the groove. This joint is opened and closed, and the bar held in place horizontally, by a slide which is controlled by the driver. The bar is held in place vertically by being made to slide between friction rollers.

INSIDE BLIND.—James Wright and Thomas Thompson, Elizabeth, N. J.—This invention consists in the employment of a jamb, hinged at one or more points so as to fold over a pocket or chamber, into which all the slats of the blind, after being folded upon one another in the usual manner, are turned. By this construction the blinds are not only folded and turned into a pocket, as is usually done, but, being covered and protected by the jamb, are not subject to defacement by the deposit of dust and other causes. The size of the room is not appreciably affected by this construction, as the jamb need only extend one inch beyond the plane surface of the walls.

WHIFFLETREE FASTENING.—Charles Ahrenbeck, Navasota, Texas.—The invention relates to the means by which single trees are attached to a double tree, and consists in hinging two hooks to a staple that is attached to one end of a double tree, while said hooks are held together at their bases by a recessed and intermediate guard plate.

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PROTRACTOR AND PARALLEL RULER.—William L. Apthrop, of Tallahassee, Florida.—This invention relates to a new instrument which is convenient for draftsmen, surveyors, etc., for laying out angles of suitable degree, and providing parallel lines of any desired inclination. It consists, principally, in an ordinary semi-circular protractor which is provided with a detachably pivoted radial arm carrying a vernier at its further end which nicely fits the convex edge of the protractor. A ruler is provided with a longitudinal slot, so as to slide along the arm. By the use of certain rods and cross bars, the instrument is converted into a parallel rule.

HOSE CART.—William E. Shaw and Charles A. Ashley, of Stockton, Cal.—This invention comprises numerous improvements in the construction of hose carts, by which they are rendered lighter, simpler in construction, and consequently less expensive to build. The improvements are so varied in their nature (occupying seven claims in the patent) that we cannot afford the space necessary to allude to them in detail.

PUMP.—Charles Wilson, of Bridgeport, Conn.—The object of this invention is to combine the advantages of a submerged with those of an elevated pump. A pump of suitable construction is supported within a reservoir of cylindrical or other shape. This reservoir is firmly secured upon the cover of the well. A pipe extends from the cover down to the lower part of the well into the water contained therein, and is provided with a check valve at its top. The reservoir is made of metal, glass, or other material so as to be practically air tight. As the pump is worked a partial vacuum is first created within the reservoir and water drawn into the same from the well until it has risen to the bottom of the pump. The water is then drawn into the pump and discharged in regular streams from its spout.

SASH BALANCE.—Benjamin Frazee, of Newark, N. J.—This invention consists in an improved method of balancing sashes, which is substantially as follows: But one sash line is used for both sashes; one end of the line is attached to one side of the lower sash and the other end to the upper side of the upper sash; the line is carried vertically up from either sash and passed over pulleys fixed in the top of the window frame in such a manner that the bight of the line hangs down in a cavity in the wall on one side of the frame. A pulley, to which is attached the balance weight, is hung in the bight and completes the arrangement.

CHAIR BACK AND CRADLE END.—Thomas W. Moore, of New York city.—The object of this invention is to form a chair back or cradle end without connecting rounds, either vertical or horizontal, and it is accomplished by constructing it of horse shoe like parts which are bent over and made to overlap, or interlace, or both, before their two ends are securely connected with the back rail of the chair or end rail of the cradle.

EXTENSION TABLE RAIL.—Lorenz Lotz, of Brooklyn, N. Y.—In this invention, the extension rail is composed of two or more sections, the upper and lower one of which are attached to the ends of the table in the usual manner. Where the sections slide one over the other, they are formed with longitudinal grooves over which are laid iron plates so as to form longitudinal recesses partially covered. In these grooves and partially covered recesses, lips and hooks projecting from transverse plates attached to the opposing sections are made to slide. The sections are thus guided and held in place to slide freely, and the wood rails are prevented coming in contact.

PLOW.—John S. Hall, of Pittsburg, Pa.—This invention furnishes an improved hill side plow, which is simple in construction and convenient in use, being easily and quickly adjusted as a right or left hand plow, and securely and firmly held in place when adjusted. The plow point is made triangular in its general form; two of its sides are made flat to serve alternately as a base and landside; the third side is concaved to adapt it to serve as the forward part of the mold board in either adjustment. An angle plate is formed upon or attached to the rear end of the point at the angle between its plane sides, the wings of which plate serve alternately as base and land side. The standard has a brace formed upon or attached to it, which projects to the rearward and curves downward. The lower ends of the standard and brace are pivoted to a rod, the forward end of which is attached to the rear part of the point near the angle between the plane sides thereof. The rod extends back along the angle of the base plate, and its rear end is attached to a transverse plate or flange. The mold board, which is double, is hinged to the forward edge of the standard. An angular bar is secured by the ends to the mold boards. The upper edge of the end parts of the bar is made straight, and horizontal to receive and fit against a shoulder formed upon the rear edge of the brace. Upon the lower edges of the end parts of the bar are formed recesses to receive the corners of the flange. Lever latches are pivoted to the rear side of the bar near its ends, in such positions that when either wing of the double mold board is moved up against the side of the brace, the end of a latch takes hold of the edge of the shoulders of the brace, and locks the various parts of the plow securely together. By this construction, by raising the free end of the latch, the parts of the plow will be released, so that it may be conveniently turned or adjusted to turn the furrow in the other direction.

FILTER.—James Brady, of New York city.—This invention consists of a cooler and filter in which a vertical division of a cylindrical vessel is made to provide an ice chamber alongside the water chambers. It is constructed of sheet metal or other suitable material, with an upright partition forming the ice chamber alluded to, and is open at the top. A pan, of about half the depth of the water space, is let in at the top of the vessel, and a second pan, half as deep as the first, is set in that—dividing the water space into three chambers. The upper part has a fine wire filter in its bottom through which the water passes into the lower one; this is provided with one or more sponge filters, and from them the water drops into the lower part of the vessel, from which it is withdrawn by a cock.

EASY CHAIR.—Dexter S. Rice, of Portland, Me.—This invention relates to a new manner of locking the hinged back of an easy chair in a suitably inclined position, and also to a novel arrangement of the foot rest for the same. It consists in a hinged back to which the arms are pivoted, and slats in the side chair rails in which the lower parts of the upright arm posts can be fixed, by pins, at various distances from the front of the chair. The arms are thus made to support the back at any required inclination. The foot rest is composed of several boards hinged together, with the top board hinged to the front of the chair. It can be set in any desired position by means of braces, and can be folded away when not in use.

INDIA RUBBER PISTON PACKING.—Isaac B. Harris, of Edinburgh, Scotland.—Piston packing formed from canvas coated with india rubber has hitherto been manufactured by rolling strips of it into straight flexible cords or ropes, either round or square. From these straight lengths pieces are cut off of varying lengths, as required, and bent round to form rings to embrace the piston rod. This mode of fitting in or applying the packing is very troublesome, and it is often put in unequally tight, and afterwards unequally crushed. To avoid these inconveniences is the object of the present invention, which consists in coiling the lengths of packing (prepared as heretofore, and while in a soft, uncured, or unvulcanized state) upon mandrels, each into a spiral (like bell pull springs), and submitting them, while retained in that form by bands or otherwise, to vulcanization. This operation gives the lengths a permanent spiral or helical set. The advantages of this form are important; for a piece of several convolutions can be cut off and expanded into fewer convolutions, or into a single ring; or a single convolution may be contracted into a greater number of convolutions, always retaining the circular form, and thus the packing will always be ready to be formed into rings to fit piston rods of various sizes more perfectly, and with more smoothness and regularity than heretofore.

FOLDING CHAIR.—John C. Compton, of Clarksville, assignor to himself and Baltus Pickel, of Trenton, N. J.—This invention relates to a new arrangement of folding chair, whereby, without increasing the cost of manufacture, the chair may be folded together for transportation, and still be sufficiently strong and durable when in position for use. The invention consists in connecting the front legs, by means of pivoted arm rests, with the chair back, and in locking the parts in position by means of an overlapping ledge on the front of a folding seat.

ANIMAL TRAP.—Lewis E. Ingersoll, of Columbus, Pa.—The invention consists in forming a trap for animals with two reception rooms, in each of which one animal may be alternately caught and delivered into a rear chamber, while the trap is set automatically and alternately, in each room, a given number of times, or until the tension of a spring and cord have been exhausted.

PORTABLE STORE COUNTER.—This invention furnishes an improved store counter, which is so constructed that, while it serves all the ordinary uses of a counter, it may be opened out to receive goods, to enable them to be readily removed from the store in case of fire or for other purposes. The base of the counter is a box about eight or ten feet long and from three to three and one half feet wide. It is made with an open top, and with close bottoms, sides, and ends. The top of the counter is made with downwardly projecting moldings around the edge of its lower side, so as to fit upon the top of the base. To the bottom of the base, legs are hinged, of such a length as when extended to raise the counter to a suitable hight. To the bottom are also attached pivoted rollers, upon which, when the legs are folded, the counter may be supported and rolled from place to place. To the upper parts of the ends of the base are attached by hinges peculiar combinations of hinged boards, the nature of which will be best understood from the use they are put to. When employed as a counter, the boards are folded down into the base, the cover is put on, and the hinged legs are extended. When, in case of fire or other cause, the goods are to be removed, the boards are unfolded and form a receptacle in which the goods to be removed are packed. The counter is then rolled away.

BOTTLE HOLDER.—William O. Pond, of Mobile, Ala.—This invention relates to an improved box for holding bottles which are intended for transportation or preservation. It consists in making the box with wooden or metallic sides and ends, and with wire top and bottom, the wires being so stretched that the necks of the bottles fill smaller openings in the lower part, while the bases of the bottles fit larger openings in the upper part of the receptacle. By this arrangement, all kinds of bottles and jars can be closely packed and securely held in position without danger of breakage, the wires being sufficiently elastic to preserve the bottles from injury, even if the box is exposed to jars or rough treatment.

BOILER TUBE SCRAPER.—Jacob Hobday, Jr., of Ansonia, Conn.—The object of this invention is to lessen the difficulty of removing dirt and incrustations from boiler flues. It consists of an improved scraper of the following construction: A spring, triangular in cross section, is bent spirally into the form of a double cone and ingeniously attached to the end of a rod which passes through it. The spring forms the scraper, and a handle of any required length may be screwed on to the rod.

BORING TOOL.—Frank S. Allen, of New York city.—This invention consists of a boring tool with cutting parts of two different sizes, for "double boring' brush blocks; it is particularly devised with reference to cutting with the least possible friction, so as to allow of running a great number in a gang together for boring all the holes of a block at once without overstraining the block or the driving gear. It consists also in the mode of construction employed. A round rod of steel is taken and milled down at one end to the intended size of the smaller boring part. A longitudinal groove is cut by a milling tool from the point as far up as may be necessary, and the lips of the larger boring part are then swaged out by a suitable tool which is forced into the groove while the bit is laid in a die of suitable shape.

BEE HIVE.—Jonathan B. Staunton, of Ellicottville, N. Y.—This invention relates to an improvement in the class of hives which are constructed with a view to controlling the formation of new colonies of bees as to time and numbers, which obviates the necessity of swarming by forming new colonies, without removing the comb frames or disturbing the bees, without danger from their stings, and without in effect changing their habitation; it consists in the construction and arrangement of certain parts by which a uniform diffusion of temperature, sound, and odor is secured throughout the entire brood chamber, together with thorough ventilation.

POTATO DIGGER.—DeWitt C. Thomas, of Easton, N. Y.—The invention consists in spading the potatoes from a row, together with their surrounding soil, and transferring both dirt and potatoes over an axle and upon a rotating sieve, by which they are separated and the potatoes emptied in the rear, or into a receptacle there placed to receive them. 2d. It consists in combining with a rotary digger a subjacent plow that mellows the ground in advance of the spades. 3d. It consists in mechanism by which all the parts are raised, lowered, locked, or unlocked, simultaneously and by the driver. 4th. It consists in side guards to retain the potatoes on the sieve and compel them to be discharged in a straight line behind the digger.

CONDUCTOR'S PORTABLE FARE AND CHANGE BOX.—James S. Hagerty, of Baltimore, Md.—The invention consists in a fare box with a safety chamber from which the fare cannot be removed when it has been dropped thereinto; it is carried on the left arm, whose hand easily manipulates the valve; it has separate and separately covered chambers for receiving different sized packages of tickets, and is also provided with chambers for the convenient location of money. In a word, it meets a want which has been long felt by the city railroad men, and they will doubtless quickly avail themselves of a portable fare box so ingenious and calculated to be so useful.

MACHINE FOR TURNING CARRIAGE AXLES.—Jonathan Grundy Aram, of Cordova, Ill., assignor of one half his right to Robt. S. Williams, of same place.—This invention consists in the use of a cutting tool, a reciprocating carriage or fulcrum, a screw shaft and ratchet mechanism, arranged in connection with a suitable pattern in such a manner that the figure of the pattern is made to control the operation of the cutting tool and thereby produce the shape required in the axle.

CHEMICAL COMPOUND FOR DESTROYING NICOTINE IN TOBACCO.—Samuel O. Bentley, of Canton, Ohio, assignor to himself and J. C. Kelly, of same place.—This invention furnishes an improved chemical compound for destroying the nicotine in cigars and smoking tobacco so as to make them non-poisonous, and at the same time to improve them by making them mild and pleasant to the taste. In preparing this compound, are taken tannic acid, one ounce; granulated nitrate of potash, one dram; powdered English valerian root, one dram; powdered nutmeg, one dram. These ingredients are thoroughly mixed, and to the mixture is added half a pint of pure water or sufficient water to case one hundred cigars. It is designed to be sprinkled upon the tobacco.

EXTENSIBLE AXLE BOX.—Charles Ahrenbeck, Navasota, Texas.—The invention consists in forming an axle box with an adjustable tube which may take up the wear on its ends and enable the wheel to be always and easily retained in its true relative position to axle. It is found by coach makers and those who let vehicles for hire that there is great end wear on the axle box, and that unless this play is quickly remedied the wheel is caused to wobble, subsequently to wear the box unequally, and in a short time to make it practically worthless. By the use of the extensible box this difficulty is obviated, while the axle box is made to last much longer and the wheel to run always with a uniform friction.

WIND WHEEL.—Newell P. Mix, of Columbus, Ohio.—This invention has for its object to improve the construction of wind wheels, so as to enable them to be more conveniently controlled, and make them more reliable in operation. A horizontal shaft, to which the sails are attached, is provided with gearing in the ordinary manner for transmitting the motion to the machinery to be driven. To the outer end of the shaft are attached wings, six, more or less, in number, and one of which we describe. Two radial arms are securely attached to the end of the shaft, and to the outer ends of the arms are pivoted the ends of a bar, to the forward edge of which are attached the fans or sails. The pivots of the bar are arranged at the rear edge of the ends, so that the centrifugal force engendered by the revolution of the wheel may tend to throw the wings out of the wind. To the inner side of the pivoted bar, near its forward edge, is attached a short arm, to the outer end of which is pivoted the outer end of a connecting rod, the inner end of which is pivoted to the outer end of a short arm, attached to a hub which oscillates upon the shaft. A spring is placed within the hub and one end connected with the hub. The other end of the spring is attached to the shaft, around which it is coiled in such a direction that its tension may tend to hold the sails to the wind. By this construction, by turning the hub toward the tension of the spring, the sails will be turned from the wind. A bent lever is pivoted at its angle or bend to the side of the hub. The outer end of the lever passes through an eye bolt or staple attached to the side of the end of the shaft which serves as a fulcrum. The inner end of the lever is inclined in such a direction that, when pressed toward the outer end of the shaft, it may turn the hub in such a direction as to turn the wings from the wind, the wings being again turned to the wind, when the lever is released, by the tension of the spring.

GRAIN SEPARATOR.—David Y. Milligan, of Shelbyville, Ill.—This invention prevents the fan in a grain separator from driving the dust and chaff back to the conveying spout and thereby defeating the purposes of the machine. It consists in the interposition of a protecting cap between the fan and conveyer spout, and in the application of a reactionary fan which drives the light matter upward and away from the conducting spout; also in the use of an adjustable slide for regulating the opening to the second fan. The invention is applicable to such separators as are connected with thrashing machines.

THILL COUPLING.—William Bailey, of Utica, N. Y.—In this invention the thill is coupled to the two jaws of the draw iron, between which it is placed, by means of a pin. This pin is square in cross section, and passes through one of the jaws and into the other, and through a box in each jaw, and also through the thill. The boxes are round, so that they readily turn in the jaws. As the thill is raised or lowered, the boxes turn in the jaws and receive the wear. A cover is confined to the side of the jaw through which the pin passes by a pivot on which it turns, and by a dovetail fastening at the end of the jaw. When the cover is closed, it effectually shuts in the pin and keeps it in place. When the cover is raised, the pin may be removed by means of a nail or a wire inserted in a hole in the opposite jaw: but it cannot come out when the vehicle is in use, and only when the thills and the cover are in a particular position.

GAS MACHINE.—Joseph Kaufman, of Jackson, Miss.—This invention relates to a new machine for generating illuminating gas from a mixture of hydrogen and carbon; and consists in a novel general arrangement and distribution of parts of which the following are the most prominent: A convenient vessel is filled with diluted sulphuric acid, and a gas holder is suspended above by a crane so that it may be raised or lowered into the vessel. This holder is weighted by an inner perforated tube which contains iron filings or shavings. Upon the holder being let down, and the air expelled, the production of the gas commences. As it is formed the weight of the holder forces it through a pipe into a gasoline holder or carburetter, and, thence, through a condenser to the service pipe.

HOPPER FOR BLAST FURNACE.—Dennis Bauman, of Parryville, Pa.—This invention consists in a hopper provided with a double inclined valve, movable thereunder, so as to feed the fuel simultaneously to the circumference and intermediate space of the fire box. The hopper is constructed so as to present an annular opening at its bottom. This opening is closed by an annular valve suspended from an overhanging lever. The valve is formed of two circular inclined planes, the inner one of which slopes toward the center and the outer toward the circumference. Upon lowering the valve, the fuel is fed by the outer inclined plane to the circumference of the fire box, and by the inner to the central space.

WASHING MACHINE.—John P. Packer, of Flemington, Pa.—This invention furnishes an improved washing machine which is simple in construction, inexpensive in manufacture, convenient in use, and effective in operation. It may be conveniently applied to an ordinary wash tub. It consists of a board or frame which lies on and is attached to the bottom of the tub. In the center of this board is hinged or pivoted a broad lever which is pierced with holes and terminates in a handle at the top. On one side of this lever is hinged an ordinary corrugated wash board, and on the other a plain wash board. They lean against opposite sides of the tub. The washing is effected by moving the lever from side to side so as to press the clothes against one or other of the two boards, squeeze the water out of them, and allow them to fall back again into the water to become saturated.

PITMAN CONNECTION FOR HARVESTERS.—Hiram Howe, of Houston, Minn.—This invention furnishes an improved device for connecting the pitman to the cutter bar of harvesters and mowers, which is so constructed as to almost entirely prevent friction and wear, and which, should there be any wear, will allow of ready adjustment. The end of the pitman (or a short bar welded to it) is formed like a cross. An arm attached to the cutter bar is formed like the letter T, and notched in the center of the top. The side arms of the T are knife edged gudgeons. The connection is made thus; The notch is placed so as to rest against the end of the cross, and eye bolts are placed on the gudgeons and fastened with nuts to the side arms of the cross on the end of the pitman.

STOVE PIPE COUPLING.—James T. McKim, Remington, Ind.—The invention consists in dispensing with wire or rivets and facilitating the putting together and taking apart of stove pipes by combining a draw band with a pivoted strap and disk. It is not only extremely simple and therefore little liable to get out of order, but is singularly effectual for the purpose intended.

HYDRAULIC CEMENT.—David O. Saylor, Allentown, Pa.—This invention relates to a new manner of treating the argillo-magnesian limestone, which is found along the Appalachian range of mountains and is used for manufacturing hydraulic cement. It consists in the mixing of raw stone, which has been reduced to an impalpable powder, with said material after the latter has been burnt; by which means several of the valuable ingredients lost in the limestone during the burning process are restored to it, and valuable properties of which the raw stone is possessed are added.

WINDOW SHUTTER.—Henry Besse, Delaware, Ohio.—In this invention the window shutters are arranged to slide laterally either in recesses in the walls, or on the outside of the walls. A screw shaft is provided for each tier of shutters. These shafts may have a continuous screw thread from end to end, or a thread for each shutter separate, screw nuts thereon being so constructed that they may be attached to the shutter and be made to engage with any part of the screw shaft. They are supported on journals at their ends and on intermediate bearings if necessary. The shutters are suspended on the screw shafts, and supported and guided by grooves at the bottom. The screw shafts are revolved by means of pulleys and cords connected with a drum. This drum is so constructed and arranged that it receives the cords from any required number of screws—say for two or more stories or tiers of windows—and by revolving it, by means of a crank or otherwise, all the screw shafts are revolved, and all the shutters moved simultaneously.

WHIP.—Alfred B. Kiersted, New Haven, Conn.—This invention produces an economically manufactured whip stock, of improved elasticity, strength and durability, which is especially adapted to jointed or socket whips in which the parts are united by screw joints. A skeleton whip stock, made by firmly connecting the weighted handle with the screw tip by means of a steel core, is filled out and completed by surrounding or filling the space between the handle and the tip of the stock with suitable filling material, such as rubber, whalebone, rattan, or wood, or by a combination of some or all of these substances, the parts composing the filling being united by cement or attached to any other suitable manner. When thus filled, the whip stock is finished by weaving upon it an exterior envelope of fibrous material.

WHEEL PLOW.—Wells C. McCool, Guthrie Center, Iowa.—This invention furnishes an improved sulky or riding plow which is simple in construction convenient in use, inexpensive in manufacture, and may be readily adjusted to cause the plow to run deeper or shallower, or to take more or less land, as may be desired. It consists principally in a draft bar or equalizer of peculiar construction, which is connected with the front cross bar of the sulky, and, also, with the plow beam, as follows: The cross bar has numerous holes formed in it to receive the bolt by which the rear end of the draft bar or equalizer is connected with it, so that the bolt may be conveniently shifted to cause the sulky to run more to the right or left, as may be desired. The equalizer is bent at right angles, and in its free or upright arm are formed several holes to receive the bolts by which a clevis and hook, either or both, are secured to the arm for the attachment of the draft, so that it may be regulated at will. The clevis and hook are bolted to the side of the upright arm, so that by changing them from one side to the other the draft may be adjusted to cause the plow to take more or less land. To the forward end of the plow beam is attached a clevis which is connected with the equalizer by a swivel, so that the plow may be drawn directly from the equalizer entirely independent of the sulky, and so that it may be turned about freely without interfering with the equalizer or sulky. To the plow handles is attached a rest to receive the driver's feet when required to assist in steadying the plow. By this arrangement the driver, by simply moving forward upon his seat, causes the plow to run deeper in the ground, and by moving backward he makes it run out of the ground.

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Practical Hints to Inventors.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

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Preliminary Examination.

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To Make an Application for a Patent.

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[Compiled from the Commissioners of Patents' Journal.]

From May 24 to June 5, 1872, inclusive.

AIR BRAKE, ETC.—G. Westinghouse, Jr., of Pittsburgh, Pa., London, Eng.
BALE TIE.—E. J. Beard, St. Louis, Mo.
BUSTLE.—A. W. Thomas, Philadelphia, Pa.
COLORING APPARATUS.—D. Bly, Rochester, N. Y.
COMBINATION TOOL.—D. Heaton, Providence, R. I.
ENGRAVING MACHINE, ETC.—T. W. Minter, New York city.
IRON AND STEEL APPARATUS.—T. S. Blair, Pittsburgh, Pa.
METALLIC PACKING.—F. W. Campbell, I. Saunders, Chicago, Ill.
PAVEMENT, ETC.—J. C. Tucker, New York city.
PERMANENT WAY, ETC.—J. L. Boone, R. Herman, San Francisco, Cal.
PLAYING CARDS.—W. S. Gottsberger, J. W. Tappin, New York city.
PRESSURE REGULATOR—N. C. and A. C. Locke, Salem, Mass.
RAILWAY RAILS, ETC.—J. A. Woodbury, Boston, Mass.
RAILWAY SLEEPERS, ETC.—A. B. Tripler, Pennsylvania, Pa.
SAFES, DOORS, AND LOCKS.—A. C. Hobbs, of Bridgeport, Conn., J. M. Hart, London, England.
SAFETY ROLLING MILL.—J. Sullivan, Boston, Mass.
SAFETY VALVE.—C. A. Trowbridge, New York city.
SEED OIL MACHINERY.—W. M. Force, A. Judson, Newark, N. J.
SPARK ARRESTER.—W. Brindle, Philadelphia, Pa.
TREADLE AND CASTER.—G. K. Proctor, J. C. Osgood, Salem, Mass.
WHEELS, ETC.—J. A. Woodbury, Boston, Mass.

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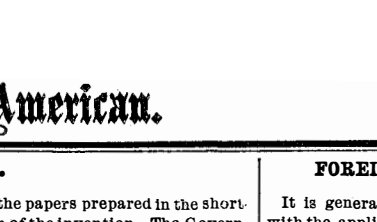

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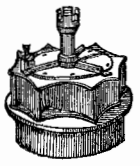

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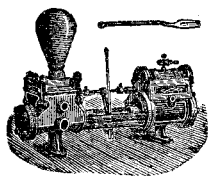

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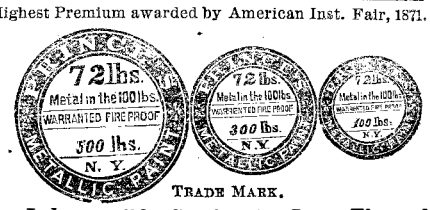

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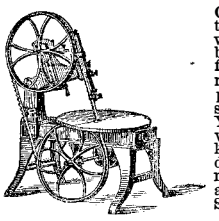

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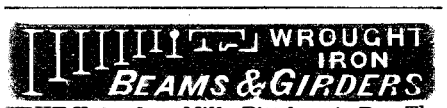

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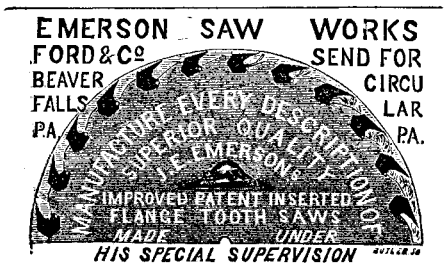

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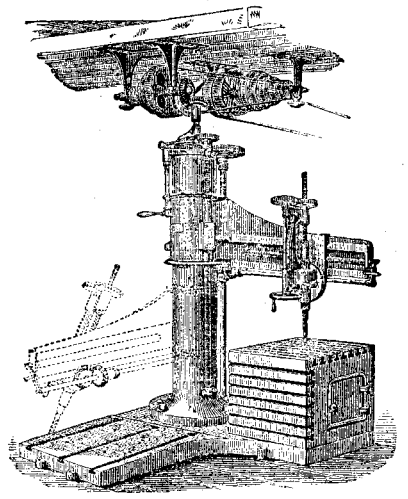

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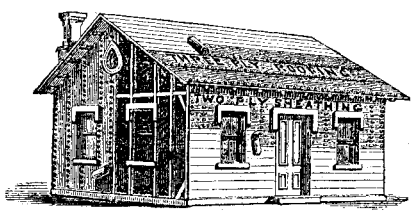

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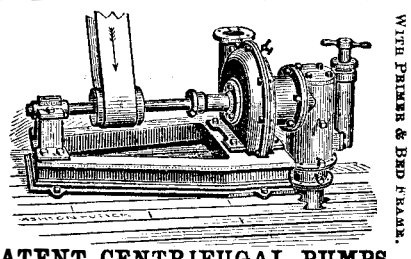

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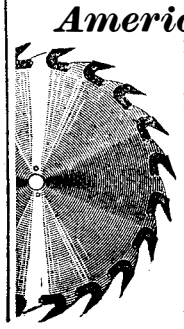

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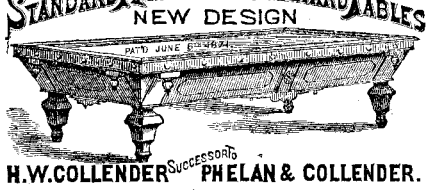

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